May, 1947

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

REQUISITION NUMBER

EVEN THE CREATURE THAT CAN PEER

BETWEEN FACTS NEEDS HELP . . .

Photo courtesy American Optical Company

DID you ever try to study the "insides" of a piece of plate glass? That suggests the trouble biologists have in trying to see the "insides" of certain micro-organisms in a conventional light-microscope. These living cells are so transparent the light passes right through them and reveals nothing. However, scientists of the American Optical Company came up with help in the form of diffraction plates which capitalize on the fact that light rays passing through a cell change in phase. Using ordinary light sources, the diffraction plates make any phase changes in the light rays luminous or blacked-out at will, throwing the structural detail into vivid and clear relief.

The foregoing also suggests the trouble youngsters have in seeing the adult ideals and standards they must acquire for successful living. Man apparently is the only creature that can peer between facts and see the relationships called honor, integrity, ambition. But like the biologist, he needs help. It is often the responsibility solely of the educator to illumine these values and make them clear and compelling. What are the diffraction plates here? Nothing the educator can pass out among his students. They are within the educator's own being or they don't exist. A way he has of approaching his subject, a willingness to be sensitive to the overtones of a boy's need. A recognition that seemingly trifling things often take on tremendous significance in the boyish mind. What wise instructor in mechanical drafting for example, would overlook the significance of the selection of the drawing instruments his students will use? These should be of fine quality, something the boy can be proud of, leading to pride in work, pride of achievement, the value of achievement, the necessity of achievement. These can well be an object lesson on the difference between good and careless workmanship, projecting in recognizable form the idea of craftsmanship, which is honesty and integrity of effort. These can be the advance guard of the greatness of mind which alone results in greatness of contribution to the public welfare. There is, to the teacher with vision, so much at stake here that he laughs in the face of anyone who says it does not matter what kind of drawing instruments are used.

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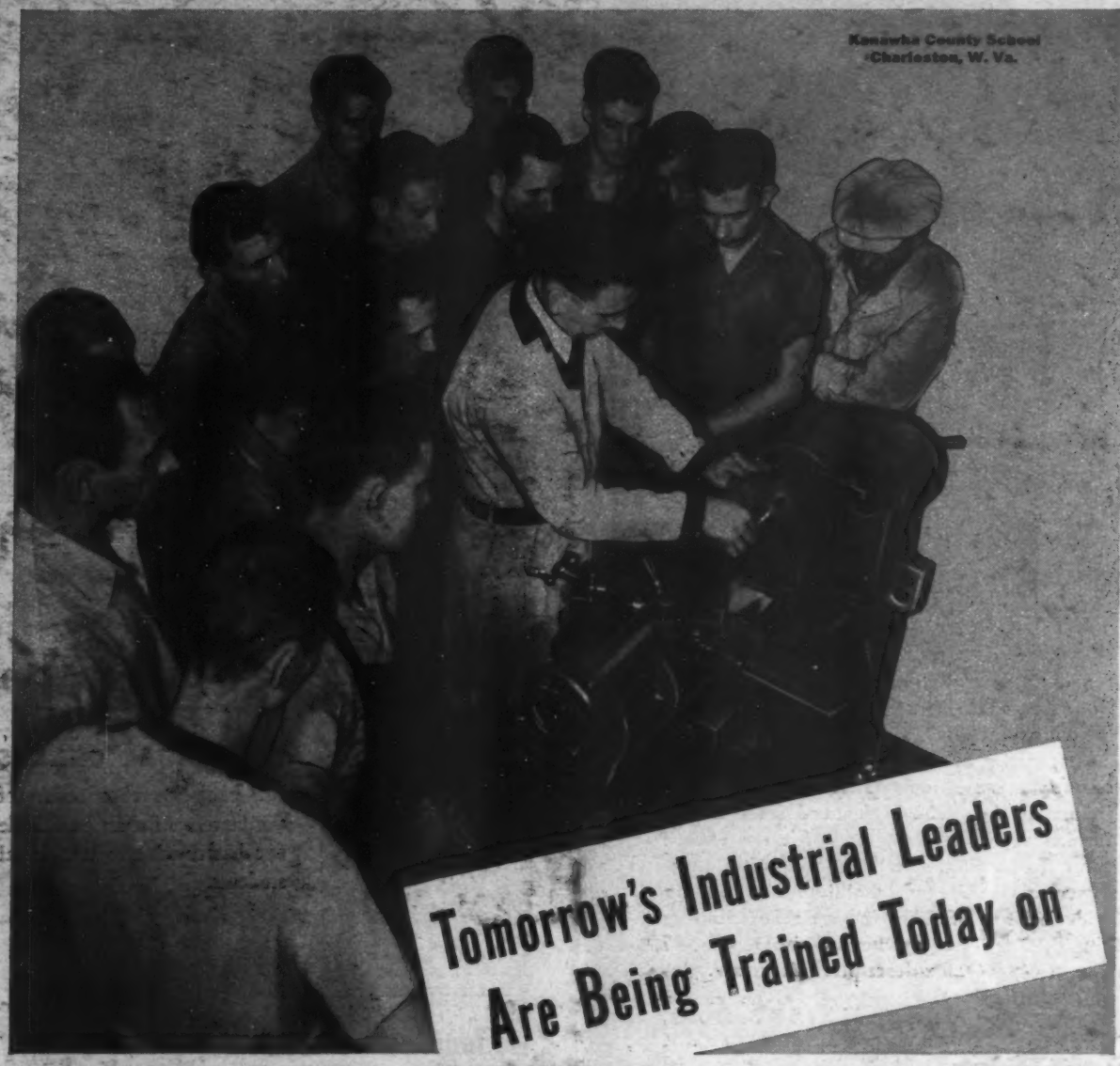

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MONOGRAPH NUMBER 3, ON ELECTRICITY

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, May, 1947, Volume 36, No. 5. Published monthly, except July and August, by The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $3.00 per year; Foreign, $3.50; Single copies, 35 cents.

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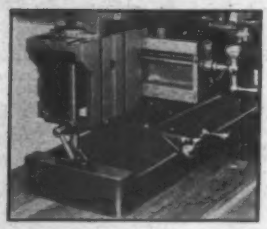

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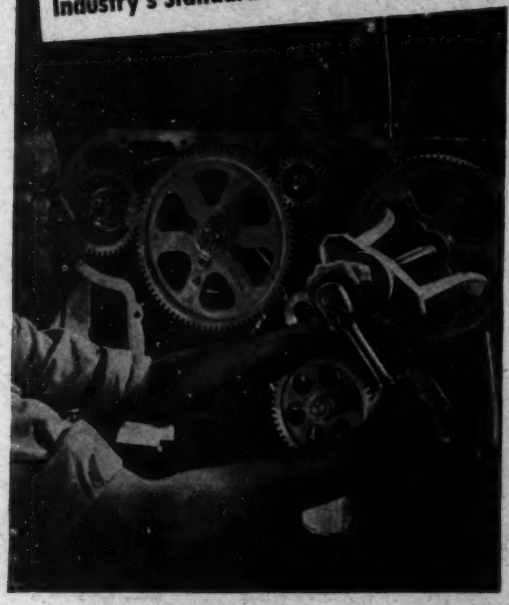

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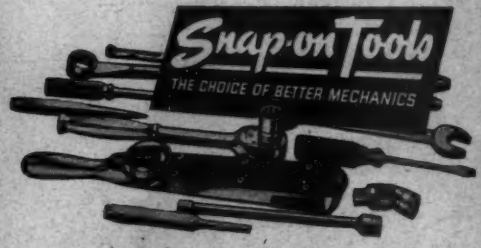

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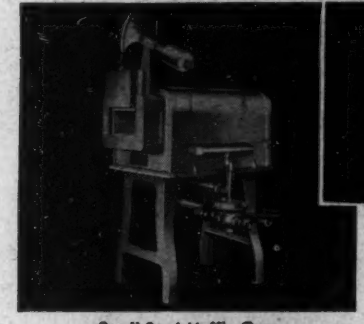

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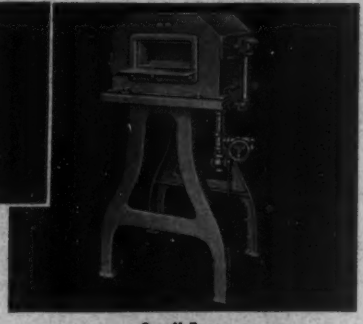

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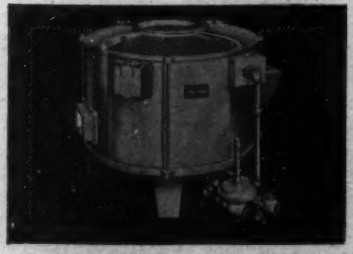

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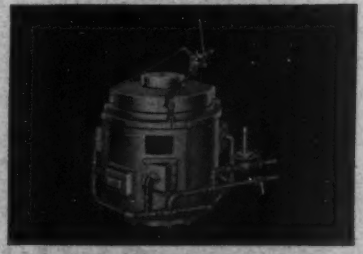

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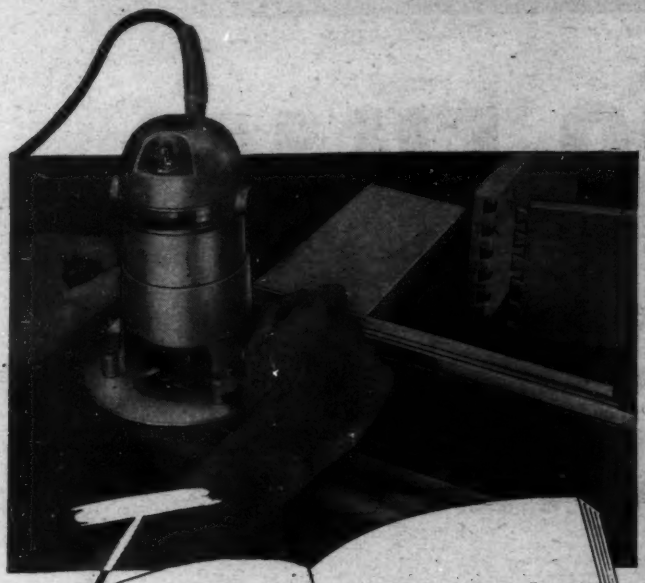

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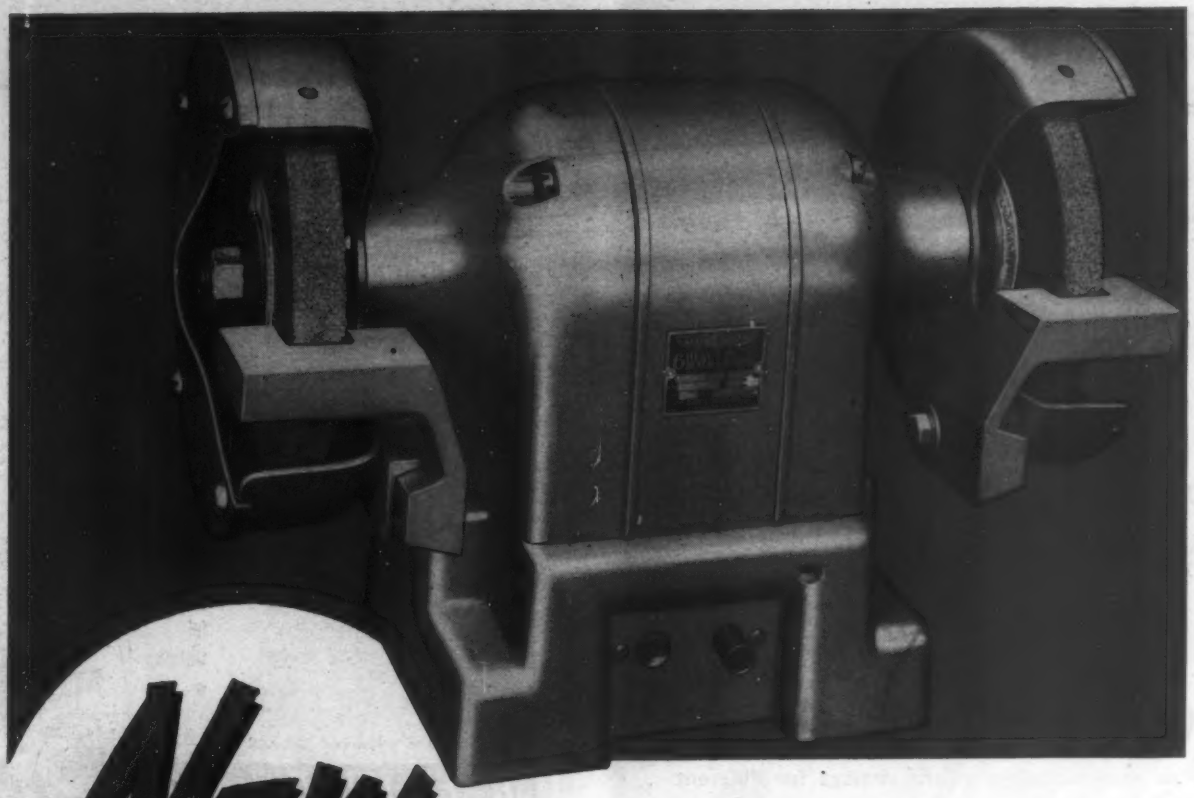

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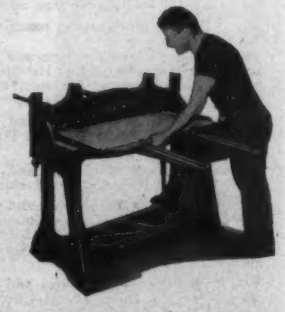

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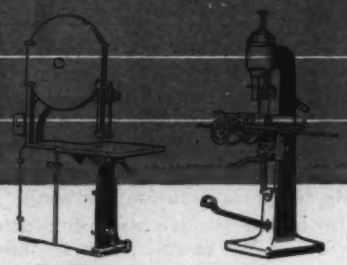

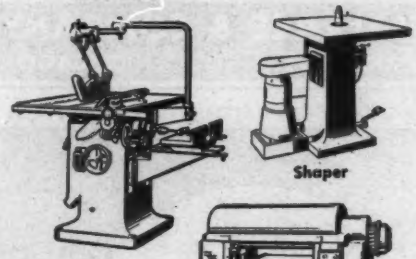

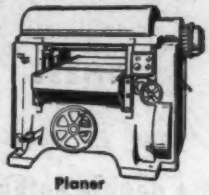

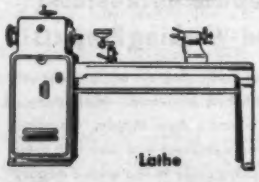

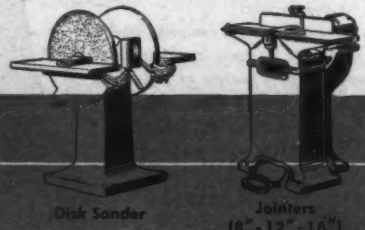

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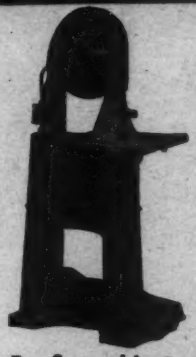

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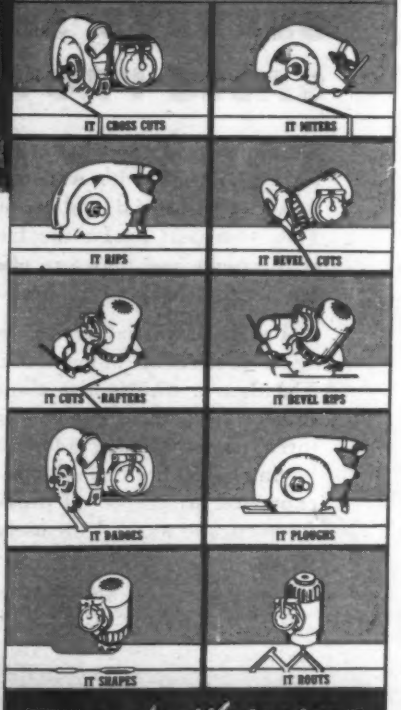

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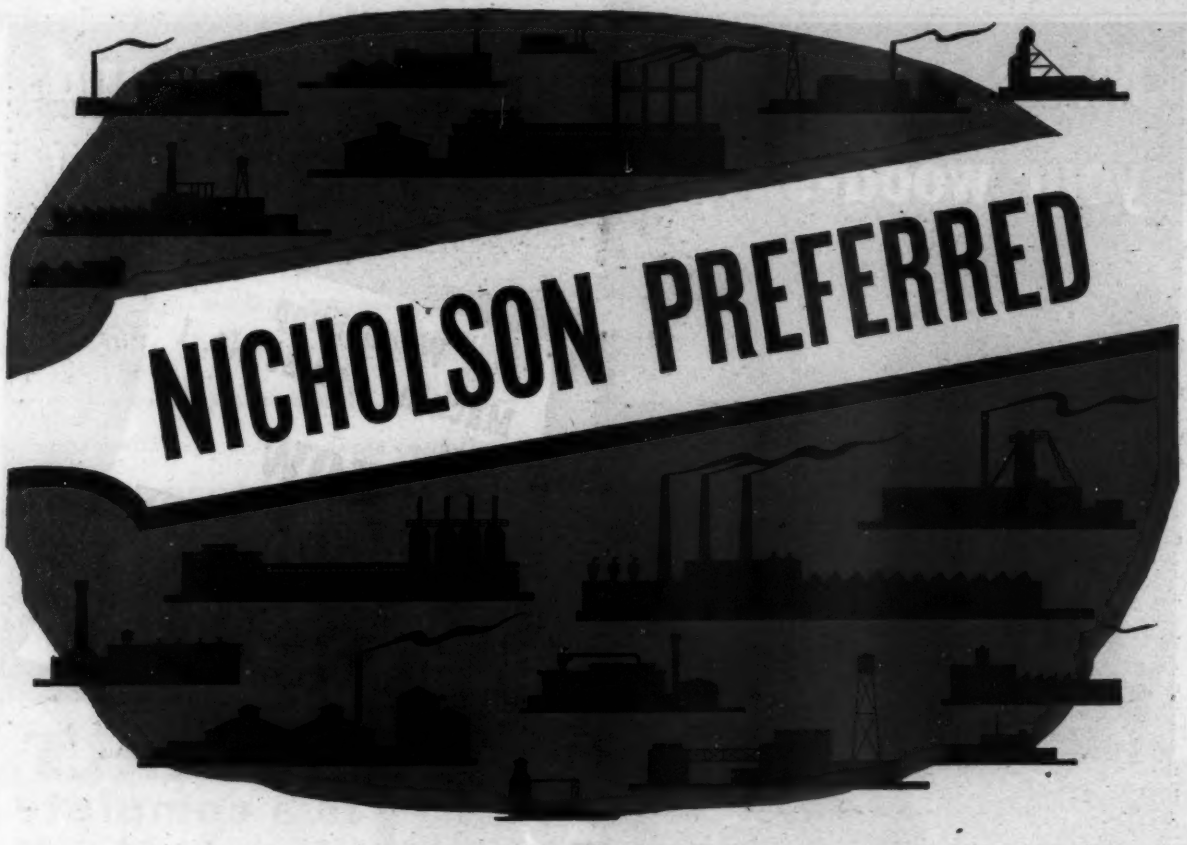

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★ A prewar survey of similar nature was similarly "Nicholson" by a wide margin.

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★ Retail hardware — another "preference pulse" — offers support: In this field an independent series of local surveys likewise indicated a clear-cut "majority" for Nicholson brands.

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▶ Requisition Time

The time to determine needs for the next school year is at hand. The May issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION arrives while there is still time to do some quiet thinking. The hustle and bustle of writing, giving, and correcting examinations; the assigning of grades; the preparing for closing exercises; the making of inventories; etc., are still in the offing; and this lull before all of these activities must be undertaken, is an ideal time to forecast what tools, equipment, supplies, and materials will be needed for the school year 1947–48.

The advertising pages of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION contain much information as to sources from which your needs may be filled. Scan over this and other issues — it will make your requisition troubles less arduous.

▼ Summer School

The month of May also is a good time for settling that vexing question, "What summer school shall I choose?"

Again the advertising pages of this and of the April issue contain information that you should have. Look over the pages of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION to see what the following institutions are offering to you.

Bradley University, Peoria, Ill.; **Cornell University,** Ithaca, N. Y.; **Oregon State College,** Portland, Ore., **Oswego State Teachers College,** Oswego, N. Y., **Pennsylvania State College,** State College, Pa., **The Stout Institute,** Menomonie, Wis., **University of Minnesota,** Minneapolis, Minn., and **Wayne University,** Detroit, Mich.

▶ Coming Conventions

April 24–26. American Industrial Arts Association at the Neil House, Columbus, Ohio.

April 30–May 3. Western Arts Association at Hotel Cleveland, Cleveland, Ohio.

May 12–15. American Association for Adult Education at U. S. Thayer Hotel, West Point, N. Y.

June 19–20. Pennsylvania Vocational Association at Forest Inn, Eagles Mere, Pa.

▶ This Month's Cover

An excursion into the field of bookbinding might be a fitting title for this month's cover picture.

It was taken at Hyde Park High School, Chicago, Ill., and was obtained through the courtesy of Dr. Louis Newkirk, director, Bureau of Industrial Arts, Chicago Public Schools.

VOL. 36, NO. 5 **MAY, 1947**

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY | **CENTRAL OFFICE: 105 SO. LA SALLE ST., CHICAGO 3, ILL.**
540 NO. MILWAUKEE ST., MILWAUKEE 1, WIS. | **EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N.Y.**

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Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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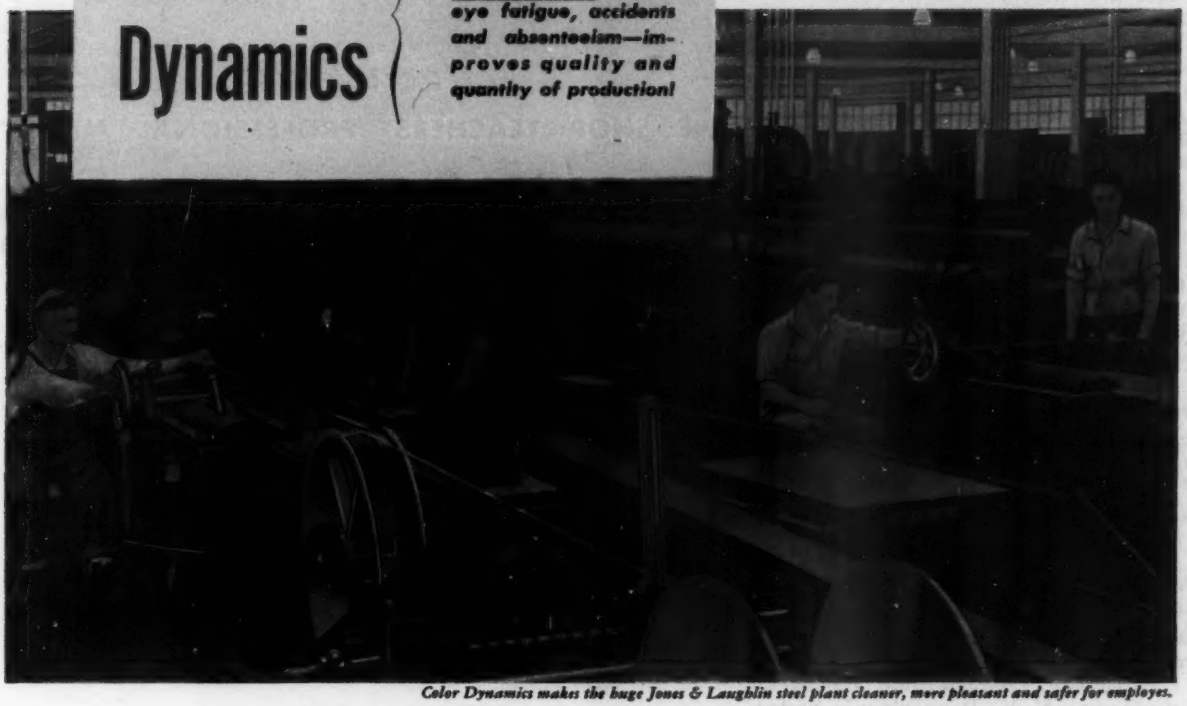

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All these are factors in industry with which the skilled shopman of tomorrow must be familiar. If you want your students to be equipped thoroughly for their future tasks, begin now to teach COLOR DYNAMICS as part of your regular course. You can demonstrate its principles in a practical manner by painting one or two machines in your manual training class rooms.

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-JAVE-

MAY 1947

Vocational Teacher Training and Certification

CECELIA RUTH EARHART
Head of the Department of Home Economics
Kansas State Teachers College
Pittsburg, Kans.

The study presented herewith should fulfill a longfelt need on the part of the state directors and the state supervisors for adequate and compact reference materials, and when it seems desirable to make changes in certification plans in any state these officials should be able to find valuable suggestions from the material presented. It should also prove interesting and valuable to vocational teacher trainers, vocational teachers, and all those interested in vocational education, secondary education, methods of certification, and terminal education of all types.

The importance of the study is further indicated by the fact that the vocational education program in America has grown very rapidly in recent years. While slightly over one million individuals were enrolled in federally aided classes and schools in 1936, involving an annual expenditure of over $30,000,000 from all sources,[1] in 1943 there were 2,300,411 individuals enrolled in vocational education courses of all kinds, involving an annual expenditure of $63,502,396.[2]

Finally, the need for this study is especially acute at this time because of the necessity of rehabilitating returning veterans from military service, taking care of workers demobilized from war-production plants, and planning for the probable expansion of vocational education of the Smith-Hughes type in the coming years.

[1] V. O. Key, Jr., *The Administration of Federal Grants to States*, p. 15 (Chicago: Public Administration Service, 1937).

[2] United States Office of Education, *Digest of Annual Reports of State Boards for Vocational Education*, p. 6 (Washington: U. S. Government Printing Office, 1944).

Delimitation of the Study

This study, "Vocational Teacher Training and Certification," has been limited to the teacher-training progress and certification procedures in trades and industries as fostered by the Smith-Hughes and George-Deen Acts. It is not concerned with costs and numbers or other statistical data, except as such data may tend to clarify and orient plans for vocational trades and industries classes and teacher-training programs. This study does not deal with teacher-training or certification in agriculture, home economics, or distributive education, except as there may be overlapping of procedure or as it seems desirable to make contrasts between philosophy or organization.

The qualifications for the first certificate are analyzed in detail for every state and territory. As much material regarding the latter renewals, term and permanent certificates is presented as it was possible to secure, not only from the state plans being studied, but from various bulletins and other sources. The later certifications in many states are tied up with the general certification policies of the state. However, the material presented concerning these procedures is very interesting, is valuable for reference work, and presents many opportunities for further study. See Tables I to XXI, which accompany this article.

Sources of Data

The data for this study were secured from many sources. The historical material was gathered from the statutes of the United States. These statutes served as the primary source for the various references to the federal educational legislative acts that have furnished federal aid to educational activities throughout the nation. Next, it was necessary to review the state plans for vocational education for trades and industries and the various teacher-training programs in each state and territory. This step involved much correspondence with state directors and state supervisors.

Federal and state bulletins on teacher training and various printed statements of policies were consulted. Bulletins from the United States Office of Education and from several libraries were examined for theses or dissertations bearing on teacher training or on the qualifications and certification requirements for vocational teachers in trades and industries.

Texts on the history and philosophy of vocational education were reviewed, as well as texts and federal bulletins on the organization and administration of vocational education.

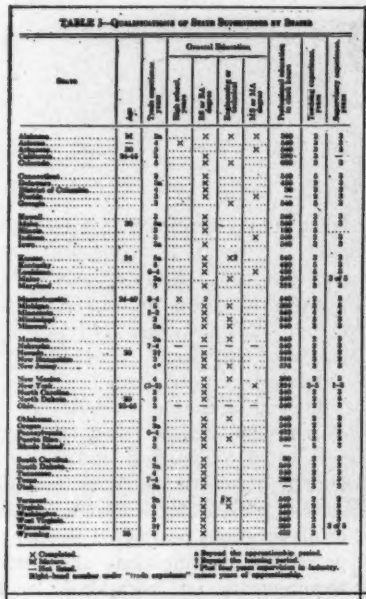
Correspondence, interviews, and conference with many state directors, supervisors, and teacher trainers, as well as vocational teachers, local directors, co-ordinators, and vocational school principals, contributed much valuable information that has amplified the data found in the state plans and bulletins. In addition, materials and information pertinent to the study were obtained from current magazine articles and federal reports.

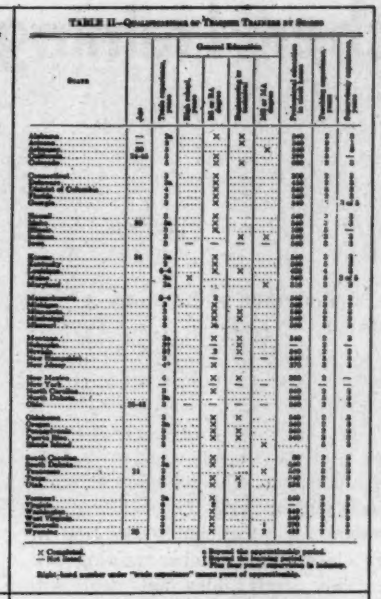
Procedures Followed

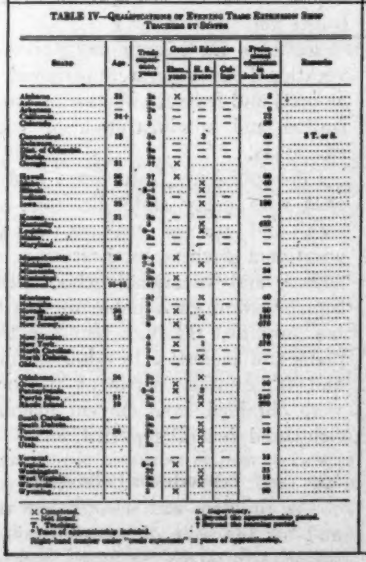
The problem was selected and outlined, and for the sake of completeness, it was essential to secure, or attain access to, all the state plans for vocational education from all states and territories, or at least the sections dealing with trade and industrial teacher training and certification. It was also necessary to check with the various State Departments of Vocational Education whose published state plans were written previous to the current period (1942–47), to determine whether any

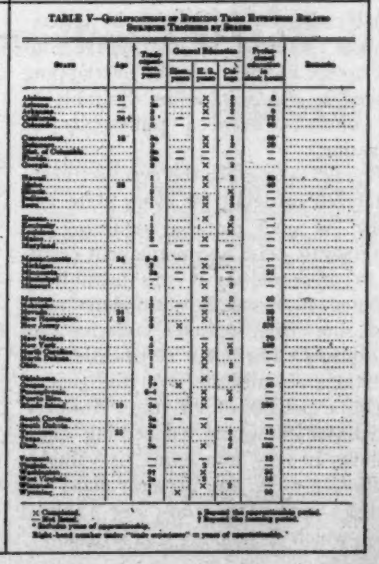
changes had been made since publication of the particular plan under consideration:

1. A list of the state directors of vocational education of all the states and territories was secured from the Office of Education of the Federal Security Agency at Washington, D. C. Letters were mailed to the state directors requesting state plans that described all the fields of work, so that possible overlapping of any programs could be noted, if any such overlapping should exist.





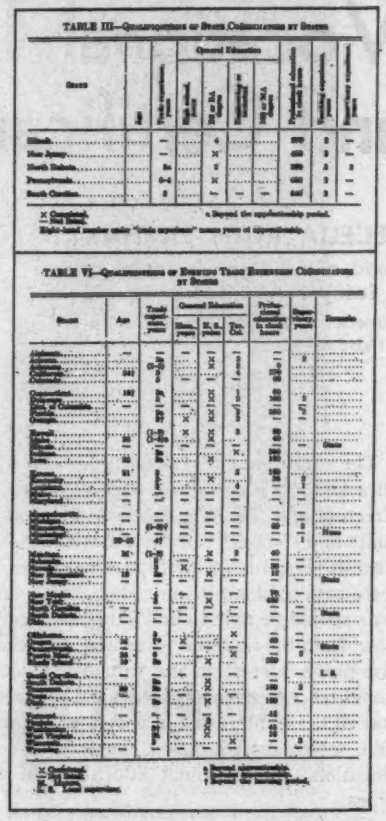




2. Documents relating to the various federal and state laws and policies were consulted; federal and state bulletins were secured, examined, and compared for similarities or differences in the trades and industries teacher-training programs; pertinent texts, course outlines, printed forms, and instructional materials were secured from representative vocational trade and industrial teacher trainers in several states; many personal contacts were made with state teacher trainers and state directors in states where it was found necessary to clarify portions of state plans and certification procedures.

3. When all possible information had been collected through such inquiry and additional correspondence, the writer went to Washington, D. C., in order to review the missing state plans and to see certain officers in the field under investigation.

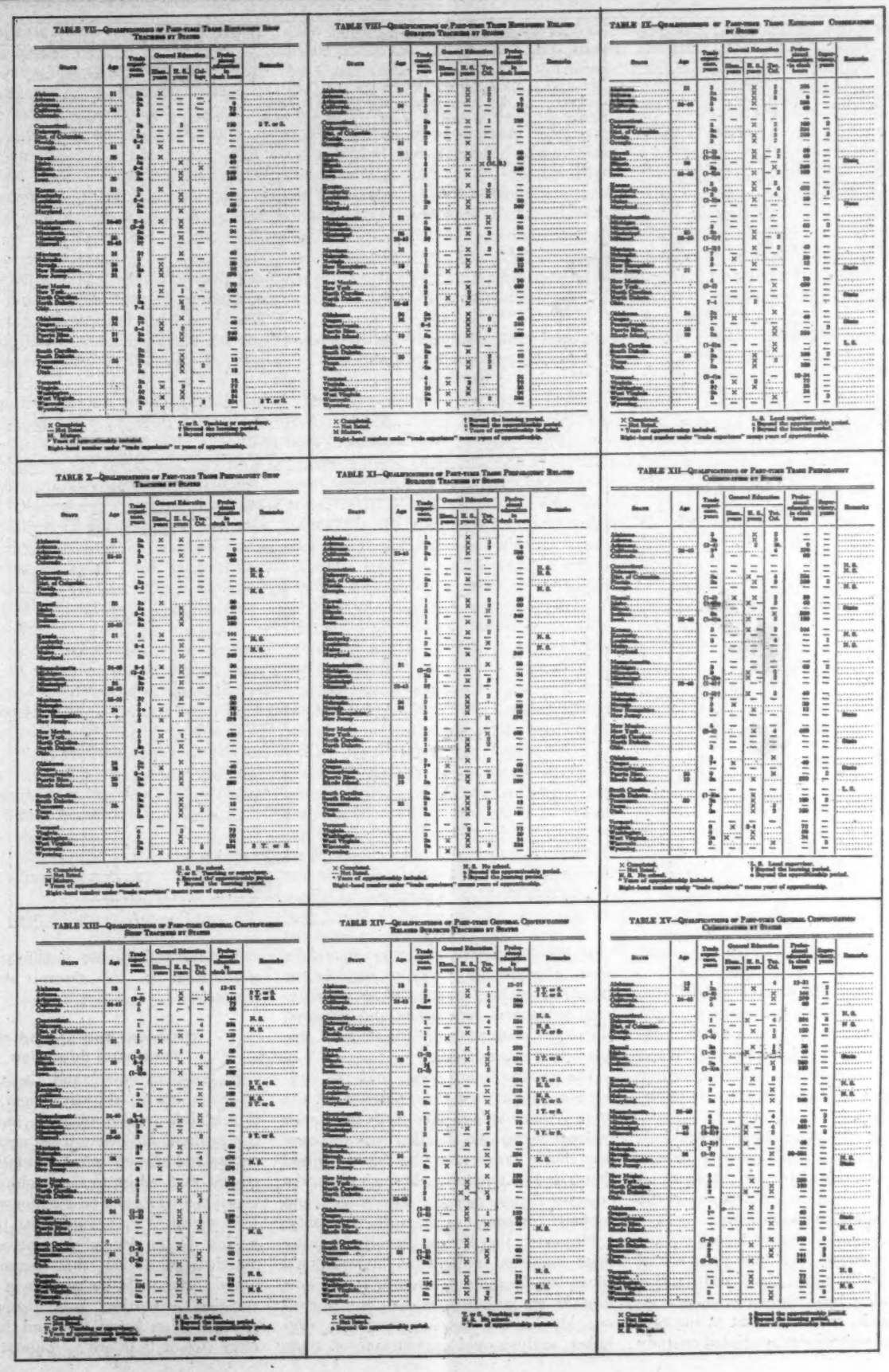
All of the territories (three) sent their plans for vocational education and characterized the material as official for the current period (1942–47). All of the states replied to the request for the state plans; 43 states or nearly 90 per cent forwarded either their state plans or the sections dealing with trades and industries; and all materials were indicated to be official for the current period (1942–47). Five states or slightly more than 10 per cent were unable to send any material, but of this number four states expressed a willingness to answer any questions that the writer might ask. This offer of co-operation was accepted and a concerted attempt was made to secure as much of the necessary information as possible by means of correspondence, telephone calls, and personal interviews. For the remainder of the material, the writer went to the Office of Education, Federal Security Agency, Washington, D. C., and received permission to examine the federal files and to collect the balance of the material to complete the investigation presented herein.

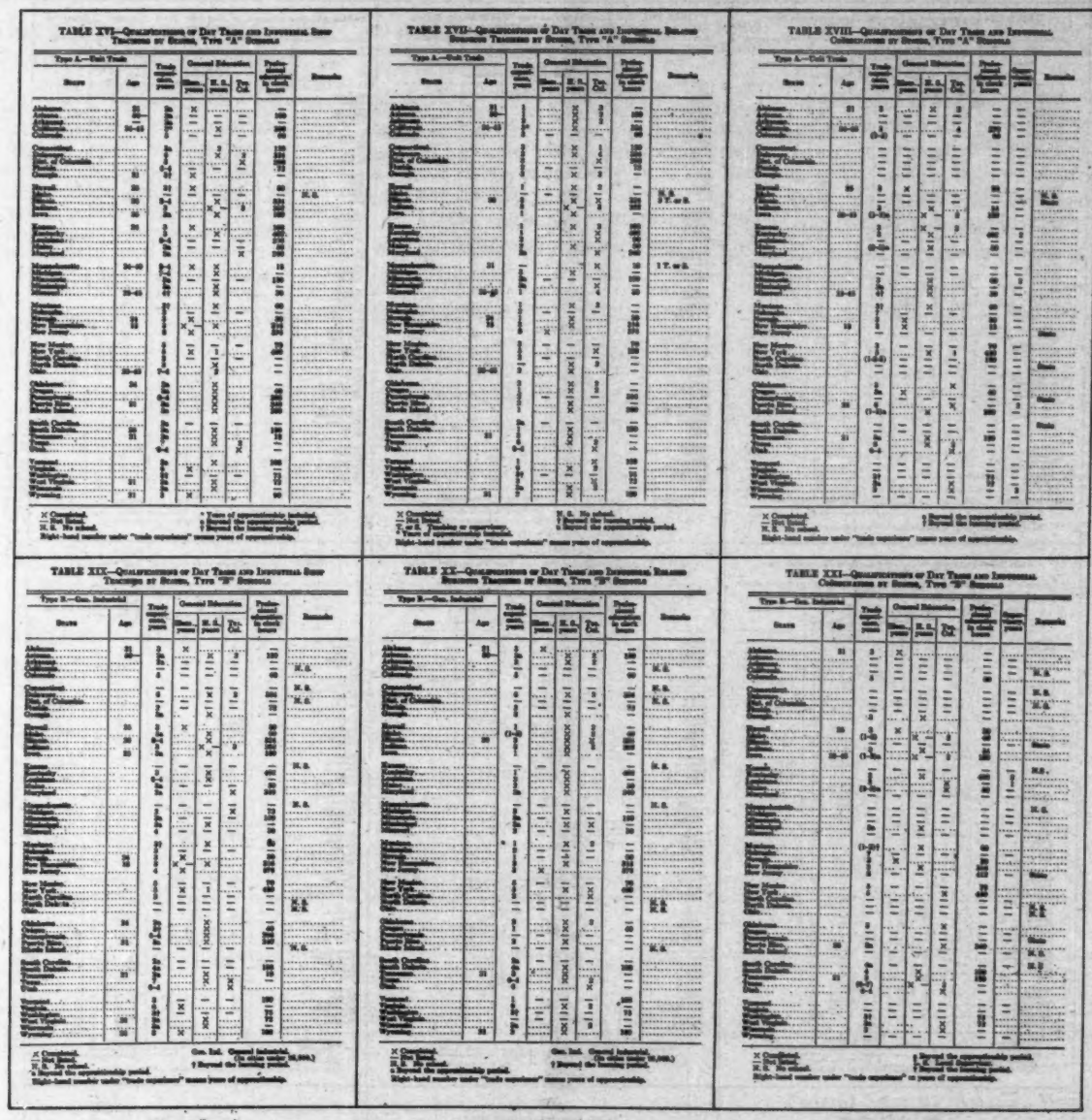


Related Studies

With the exception of a few brief federal bulletins, all materials located regarding teacher certification in the field of trades and industries have been limited to mimeographed regional reports that are not available for general distribution. Furthermore, there is little in the way of research or thesis studies in the field of vocational teacher training in the trades and industries that concerns detailed analysis of certification for teachers.

Regional Reports. A few regional reports by Paine, De Forest, McGarvey, Emons, Whitney, Spofford, Johnson, and Myers dealt with administration and certification





procedures in a few states or small territories.

National Surveys. Weaver studied the qualifications of vocational teachers for the unit trade, day school (Type A) on a national basis; and Woellner and Wood compiled certification procedures according to the various states for the regular public school teachers.

Conference Reports. A small federal bulletin was located containing four reports that had been written to the committee on trade and industrial teacher training of the American Vocational Association.

McGarvey and Whitney report conferences that covered such topics as: school life, air conditioning, time and motion studies, trade school graduates, and co-operative schools, and notes that at the conference a committee was appointed to study what was being done and what should be done or required by way of services for industrial teacher training and for improvement of teachers, supervisors, and directors. No report concerning the findings of this committee is available.

The reports summarized and the conferences cited, with the exception of the brief Weaver study, have dealt only with regional areas. No detailed surveys have been made concerning the entire United States and its territories. In most cases, the objectives were more or less limited and confined to some specific state or locality.

However, the limited reports indicate that prominent individuals in vocational education have been interested for some time in an investigation like the present one, but lack of time has prevented a detailed analysis and comparison of trade and industrial teacher qualifications and certification in the several states and territories.

Historical Background of Vocational Education

In order to understand the vocational trade and industrial program and its teacher selection, teacher training, and teacher certification activities, it is necessary to understand the historical legislative background that led up to the establishment of vocational education on a nationwide basis. This historical background with brief summaries of the federal legislative aids to practical education that preceded and paved the way for the passage of the basic vocation education acts, namely: the Smith-Hughes Act of 1917 and the George-Deen Act of 1936 are as follows:

Federal educational legislation preceding the Smith-Hughes Act:

1. The first Morrill Act — July 2, 1862
2. The Hatch Act — March 2, 1887
3. The Second Morrill Act — 1890
4. The Adams Act — March 16, 1906
5. The Smith-Lever Act — May 3, 1914

The first Morrill Act provided land grants to colleges for the establishments of agriculture and mechanic arts. This was followed by the Hatch Act which established experiment stations in these land-grant institutions. The second Morrill Act provided funds for the related studies applying to the industries of life. The Adams Act appropriated continuing funds for the experiment stations established by the Hatch Act.

The Smith-Lever Act provided funds for co-operative extension work in agriculture and home economics. It brought the college to the farm and home, but had little to do with trade and industrial education. However, it introduced the principle of detailed specifications governing the expenditure of federal funds when used for state aid purposes. Many of the characteristics of the Smith-Lever Law appear in later legislation that dealt with specific vocational problems.

The Smith-Hughes Act. The Smith-Hughes Act provided funds for instructional purposes and teacher training in the fields of agriculture, home economics, and trades and industries. This Act, passed in February, 1917, was the first basic law to promote vocational education on a national basis for students of less than college grade. Like the Smith-Lever Act, the legislation is detailed and specific.

Federal educational legislation between the Smith-Hughes Act and the George-Deen Act:

1. The Smith-Sears Act — June 27, 1918
2. The Smith-Bankhead Act — June 2, 1920
3. The George-Reed Act — February 5, 1929
4. The George-Ellzey Act — May 21, 1934

The Smith-Sears Act and the Smith-Bankhead Act dealt with rehabilitation of returned veterans of World War I as well as the rehabilitation of civilians disabled in industry. The George-Reed Act extended appropriations for instructional purposes in the agriculture and home-economic subjects, but had nothing to do with activities in trade and industries. The George-Ellzey Act was a temporary extension of the provisions of the George-Reed Act.

The George-Deen Act. The permanent expansion of activities and funds for the major act in the background of this study (the Smith-Hughes Act) was finally established under the George-Deen Act, passed by Congress on June 8, 1936, to become effective July 1, 1937. This law authorized, on a permanent basis, increased appropriations to the states and territories for vocational education in the fields already aided and in addition authorized appropriations for use in the field of distributive occupations. It was specified also in this Act that the District of Columbia should be included within the meaning of the term "States and Territories," to receive the benefits of the provisions for vocational education.

Policies of the Vocational Education Acts and Interpretations Essential for This Study

Only those types of vocational education that relate to trades and industries have been considered.

Terminology. Industrial education of the vocational type which is contemplated under the terms of the National Vocational Education Act, and other forms of industrial education commonly known as manual training, industrial arts, exploratory or finding courses, or manual arts. All the latter types of industrial education are considered by the Federal Board as phases of general education, and it is believed that the development of efficient trade and industrial education of the vocational type would be promoted in the United States if school administrators generally would make similar or equivalent distinctions.

Definition. The definition of vocational education for trades and industries has been stated as being the type of education and training that is intended: (1) to assist the individuals already employed in trades and industrial occupations to add to their special knowledge and skill appertaining to their work; to improve their prospects for steady and permanent employment, or to prepare themselves for promotion and advancement; (2) to prepare individuals for profitable and advantageous entrance into the mechanical trades or industrial pursuits with known marketable assets in the way of special knowledge and skill; and (3) to assist employed minors in adjusting themselves to their work and to the existing social order through such types of education as are properly given in the general continuation school.

Philosophy. The philosophy of vocational education has been stated as: (1) instruction of less than college grade, (2) for persons over 14 years of age, (3) to fit for useful employment, (4) to increase skills and related knowledge of employed workers, and (5) to increase the vocational and civic intelligence of young workers. Federal administration and supervision was shown through the creation, establishment, and growth of the Federal Board of Vocation Education by the Smith-Hughes Act of 1917, up to its present affiliation with the United States Office of Education, Federal Security Agency.

State Supervision. State supervision was discussed through the two methods of control: namely, unit and dual. In the former (unit control) the chief executive officer is the controlling officer of both the state department of education and the state department of vocational education, while in the latter (dual) each department functions separately.

Types of Schools or Classes:

1. Evening trade extension for persons over 16 years of age who have entered employment; classes to be given at any time the group can meet.
2. Part-time trade extension for persons 14 to 18 years of age who have entered upon the work of a trade or industrial pursuit; classes offered during the hours of work and considered as part-time instruction.
3. Part-time trade preparatory for persons 14 to 18 years of age who have entered upon employment; instruction designed to fit such persons for a trade other than the one in which they are engaged.
4. Part-time general continuation for persons 14 to 18 years of age who have entered employment, yet need to enlarge their civic or vocational intelligence.
5. The day trade and industrial, Type *A*, for the purpose of preparing persons over 14 years of age for useful employment in a particular trade or industrial pursuit; classes to extend over a period of not less than 36 weeks, one half the time to be practical work on a productive basis and to operate not less than 30 clock hours per week.
6. The day trade and industrial, Type *B*, for the same work as Type *A*, except that this type of school or class is designed for cities of less than 25,000 population and certain requirements are relaxed to fit the needs of the smaller communities.

Comparative Analyses of the Qualifications of State Supervisors, State Co-ordinators, Teacher Trainers, Vocational Teachers, and Teacher Certification Requirements

A comparative analysis of the qualifications of state supervisors, state co-ordinators, teacher trainers, and vocational teachers as well as teacher certification requirements was made. The materials concerning the vocational personnel were presented in chart form according to the age, trade, experience, general education, professional education, teaching experience, and supervisory experience. The qualifications for the shop teachers, related teachers, and co-ordinators for each type of school were analyzed in separate tables, and a representative individual from each group was described according to the findings of the study.

The representative initial age for state

supervisors is 20–45 years, while the teacher trainers is 25 years. The state co-ordinators was not available. Trade, teaching, and supervisory experience required three years each, some variation being allowed in the case of the state co-ordinator who might be required to have only two years of experience in each of the above fields. General and professional education were found to be quite uniform, a bachelor's degree being necessary for all three positions. Five hundred forty clock hours of professional education were required of state supervisors and teacher trainers, while considerably less, 432 clock hours, were required of state co-ordinators.

Evening trade extension shop teachers were required to be 24 years of age and have at least three years of trade experience. The evening trade extension related teachers may be the same age but must have two years of trade experience. The evening trade extension co-ordinator is permitted to begin his job at 24–25 years of age. In addition to three years of trade experience, he must possess also two years of supervisory experience.

All three of the above positions require a high school education, with an additional two years of college for the related teacher and co-ordinator. The shop teacher and co-ordinator must have 60 hours of professional education, while the related teacher may have but 40 hours. No doubt this is due to the fact that the general education of the related teachers usually has been more extensive.

The part-time trade extension shop teacher may begin his work as an instructor or at the age of 24 years, and the related subjects teacher may begin at 24 years also. The shop teacher is required to have two to three years of trade experience, while the related teacher may have only two years. This is reversed as far as general education is concerned, in that the related teacher is required to have approximately two years of college work as compared with high school graduation only for shop teachers. The number of hours of professional education required of the shop teacher is quite definite, 50–60 hours, and the related teachers may begin also with 50–60 hours.

No doubt the reasoning back of this corresponds to the fact that the shop teacher should have as much professional training as the related teacher.

The co-ordinator of the part-time extension school is required to have qualifications equal to or beyond both the shop and related teacher, with more definite number of clock hours, namely, 70, of professional education; he must have two years of work beyond his high school education, and have had two years of supervisory experience.

Part-time trade preparatory shop and related teachers have practically the same age range, namely, 24–25. The trade experience requirement for the shop teacher and the related teacher is approximately the same except that the shop teachers need three years, while the related teacher may begin teaching with only two. The related teacher must have two additional years of formal education, as was the case for the part-time trade extension instructor.

The number of clock hours of professional education required for the shop teacher and the related teacher is 60 hours for the majority.

The part-time trade preparatory co-ordinator must possess at least the same qualifications as those of the shop and related teacher. His professional education ranges from 60 to 72 clock hours with two years of supervisory experience also required.

In the part-time general continuation school, the shop and related teachers have the same beginning age 24, but the shop teacher may begin as late as 40 years. The trade experience for the shop teacher is two years, while that of the related teacher may be as low as one year. Both groups are required by the majority of the states to have at least two years of college work.

The beginning number of hours of professional education is 108 to 120 for the shop teacher as compared with 120 hours for the related teacher. It should be noted that none of the other groups of related teachers is required to have teaching experience before employment; however, eight states require that their related teachers in the general education continuation school have at least two years of such experience.

The part-time general continuation co-ordinator may begin work between 24–40 years of age, and is required to have from one to three years, preferably two years, of trade experience, hold a bachelor's degree, have 108 to 180 clock hours of professional education, and have spent two years in supervisory work.

The all-day trade shop teachers are, as a rule, about the same age as the related teachers in the all-day trade school, when they enter their profession; both enter at approximately 24 years. The co-ordinator in this school may start also at the age of 24 years.

The trade experience for the shop teacher is three years, while that of the related teacher is two years. Shop teachers must be high school graduates, but related teachers and co-ordinators must have at least two years of education beyond the high school level.

The shop teachers, in this school, may begin with 120 hours of professional education, related teachers with 150–180 hours, but co-ordinators begin at approximately 72 hours.

Only the co-ordinator in the all-day trade school is required to have from two to three years, preferably two years, of supervisory experience as an entrance requirement. It is interesting to note that only one state out of the 48 states and three territories fails to make provisions for schools of this type.

The day trade and industrial shop teacher of the Type *B* school teaches in cities of less than 25,000 population. Both shop and related teachers must be at least 21 years of age. The shop teacher must have three years of trade experience, while the related teacher needs but two. The shop teacher must be a graduate of a high school, but the related teacher must have at least two years of college work. The shop teacher may begin teaching with 100 clock hours of professional education, while the related teacher is required to have 108–150 clock hours.

The co-ordinator possesses qualifications similar to the shop and related teacher except that he is required to be 25 years of age, have two years of supervisory experience, and have completed 75–80 clock hours of professional education.

Conclusions and Recommendations

First, little has been done, on a national scale at least, in compiling and analyzing materials dealing with the selection and certification procedures for the many types of vocational personnel in the various states and territories. There is a marked dearth of these federal bulletins or other materials concerning these procedures.

Second, this study discloses great variation in the many state plans regarding the trade experience, general and professional education, and other qualifications required for the vocational trade and industrial personnel of the different states. Much apparently remains to be done in these areas if America is to develop standardized procedures in these fields.

Third, certification procedures revealed by the study vary greatly throughout the nation. For example, all states require some form of temporary certificate, but many states present no further provisions for advanced certification, at least in their state plans. Other states have a well-developed and progressive certification program, with definite requirements for advanced certificates. Many states also make provisions for a life of permanent certificates; other states issue a provisional type of life certificate, setting up definite stipulations as to the procedures required to keep it functioning. Still other states issue only certif-

icates that must be renewed from year to year. Certification procedures can be said to be as varied in the vocational education field as in the field of general education. A thorough study of this area by the United States Office of Education or a committee appointed by it should do much to improve certification procedures.

Fourth, the vocational teacher training or certification courses required in the various states vary greatly. A list discloses 199 titles. Obviously a very valuable and interesting study could be made in this field if data could be secured regarding the content of the courses offered in the various states. Such an investigation would doubtless show similarity of content for courses listed under different titles. This would tend to verify the conclusion sometimes drawn that course titles may often be the result of an individual desire to exhibit originality at the expense of uniformity of terminology. It would seem that teacher training courses embracing similar content might be designated more uniformly and thus simplify and clarify the evaluation of teacher qualifications between states. Like the matter of certificates discussed in the foregoing, centrally sponsored study should prove to be of great benefit in developing more uniform procedures.

Much more detailed and thorough studies of various separate areas included in the present work would unearth additional interesting and valuable material. If possible such investigations should be made at an early date, since much interest exists in the vocational education movement at this time, and the program undoubtedly faces the possibility of marked expansion in the postwar period immediately ahead.

The detailed study of the content of certification previously suggested would unquestionably prove extremely interesting, and the vocational teacher trainers in the various states, as well as the administrative officers, should profit greatly from such a study. Detailed analyses of administrative and other relationships existing between the vocational and general certification procedures in the various states should be of value to both general and vocational education in pointing out trends and suggesting possibilities of improvement.

Furthermore, it is hoped that additional inquiries such as the present study will be made not only in the field of trades and industries, but in vocational agriculture, home economics, industrial arts, and distributive education as well. If the present dissertation is of assistance in setting them up, or if it furnishes a pattern for prosecuting them, the writer will be greatly pleased. As already pointed out much work can be done in the field of vocational education to establish more uniform methods of selecting and certifying vocational personnel. Apparently little stereotyping exists in the various states' plans, and as these plans are revised every five years, as required by the Federal Office of Education, state directors and supervisors should study the data presented in this and other studies of a similar character to develop better and more satisfactory certification procedures in their own states.

The data and reference materials presented in this dissertation should be made available for study in regional and national meetings of state directors, state supervisors, teacher trainers, and others interested in improving vocational education procedures. Obviously this would mean publishing and distributing the study to the interested individuals on a nationwide basis. This could best be done by the Office of Education. Several members of the office have indicated their interest in such a project by requesting that the completed dissertation be sent to them for review with that purpose in mind.

Finally, it is hoped that this and similar studies will contribute to producing better vocational teaching and better programs of vocational education in America by disclosing opportunities for improving and standardizing (without stereotyping) our vocational teacher selection, teacher certification, and teacher training procedures.

Vocational Education and Society

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(Continued from page 50 of the February, 1947, issue)

The Director Must Co-operate

It has been said that the director has certain activities which ar administrative and others which are supervisory in character. The efficiency with which he performs in either of these areas depends to a large extent upon the co-operation he obtains from other individuals or groups. Unfortunately, some directors are so absorbed in the details of securing, distributing, and accounting for supplies and equipment that they have no time left for building up a co-operative spirit in the community. It is true that they welcome co-operation when they are fortunate enough to get it, but co-operation is a tool that the director uses to get something done more effectively. Because of this, it is just as much his responsibility to be active in securing it as it is for him to develop a desirable record system or an effective system of accounting.

There are many individuals and groups who are so situated that they can be helpful to the director in numerous ways. In some cases it is assumed that these aids can be ignored until they are needed. However, co-operation springs naturally from respect and confidence, and these must be built up by the director through constant contact with people. These contacts can be attained only when the director is alert and makes opportunities to keep the public informed concerning his objectives, his plans, and the achievements of his department. When people acquire this respect for the director and for his work they constitute an asset which is bound to benefit the department. When school activities are mentioned in their presence they need no stimulation to promote the cause of industrial work, and when aid is needed in selling a program to the board or to the public a call for help finds them ready.

These different individuals, groups, or agencies may be classified under different heads, such as:

Those found within the school organization:

1. The superintendent has to view the school system from a general point of view so it cannot be assumed that he has an intimate knowledge of what is occurring in each department. Because of this he must rely upon the director to keep him informed. In doing this the director must avoid the mistake of taking the time of the superintendent to discuss every detail.

2. The director has had certain responsibilities assigned to him and his work is evaluated on the basis of the extent to which he carries them. However, if he expects the superintendent to co-operate with him he must inform his superior concerning matters of interest to him, and he should by all means, discuss with him matters of policy which may affect, or be affected by

the general policies of the school. This may be done by different methods:

3. The superintendent usually makes it clear to his assistants that, while he has assigned to them certain definite tasks, he is always happy to advise with them on matters pertaining to their departments. Because of this attitude the director may ask for an appointment for the purpose of discussing his problems. If this procedure is followed care must be taken to request these conferences only when the importance of the subject to be discussed warrants them. The superintendent is busy and, as a rule, has little time for mere visiting. The director is also busy and should be careful to conserve his time as well as that of his superior.

4. The superintendent has many opportunities to promote the work of any department provided he knows what the director is attempting to do. When these opportunities occur the superintendent is happy when he is able to talk intelligently about what is happening in his schools. This happiness is reflected in his attitude toward the director who made it possible for him to demonstrate that he knows what is happening.

In order that he may feel qualified to speak authoritatively the director should form the habit of sending him a memorandum concerning any matter of general interest in the department. It might be about an especially good piece of work done by a student; it might be about a new method or piece of apparatus developed by a teacher; or it might be about an exhibition or open night about to be held.

The superintendent may not read all of them. Some of them may even find their way into the wastepaper basket, but some of the items will get his interest and, when a parent or a board member mentions it to him, he will take pride in being able to appear intelligent about it.

5. Each year the superintendent must make a formal report to his board. The value of this report is governed to some extent by the information he gets from his assistants. In view of this, the director should follow the practice of submitting an annual report to the administration covering all of the activities of his department. How many pupils have you had in each type of work and how are they distributed? What has been the cost per student in each type of work? How much work has been done in the department for the school system, and what is its commercial value? What plans do you have for the growth of the department, etc.? All of these and many other matters are of interest to the administration and the director should make sure that they have them. It is possible that a report of this kind may not be asked for but, whether it is or not, it should be presented. Even if the superintendent does not use the information, at least he has it, the director has the satisfaction of having presented it to him, and the director has in his files a record which is likely to prove valuable to him later.

6. The school principal:

The principal is supreme in the building for which he is responsible. The director of industrial education acts in an advisory capacity to the principal in matters pertaining to the field of industrial education. It is true that in many cases the director actually supervises and directs the work personally; however, he does this because the principal has confidence in him and is willing to have him direct the work of his shop teachers. In other words, the principal co-operates and simplifies the directors' administrative tasks.

If the principal were non-co-operative, and exercised the rights vested in him as principal, the director might find greater difficulty in carrying out his plans.

In view of this it is good policy, as well as good business, for the director to discuss with the principal any policies or plans concerning the department, with which he should be familiar, *while they are being considered*, and certainly *before* they are put into operation. While the position of the director may be strong enough to make this unnecessary, it is always a wise procedure.

In most school systems the principals and other staff members in the higher positions meet at intervals to discuss problems. Then, too, in some states, principals have a state organization of their own, or they meet together during the state teachers' institute or convention. If the director is to have the full co-operation of this group it is necessary that he mix freely with them; he must attend the meetings they attend, and convince them of his professional standing. By this means he is likely to gain their respect and thus secure their co-operation in carrying on the work of his department.

The success of the director depends upon the success of the work in the schools. The success of the work in the schools depends upon the principals. If the principal is with him and is willing to co-operate, the problems of the director are simplified.

7. The teachers:

The director cannot be fully efficient unless he has the full co-operation of his teachers. He must depend upon them when courses of study have to be developed. It is true that he must provide the leadership and guidance to do this but they are the specialists who actually know what the content of their courses should be.

The superintendent asks the director for certain reports and these reports are usually due on specific dates. The accuracy of the reports, as well as the promptness of each teacher is considered. If the superintendent finds that the information he receives is inaccurate, or if his report is late because of a delay in the director's report, his confidence in his staff is affected.

But how can the co-operation of the teachers be obtained? In the first place, the reaction of the teacher is likely to be similar to that of the average human. He likes to be treated fairly; he resents criticism that is not constructive; he likes to be consulted on matters that affect him; and he appreciates being given credit for having something to contribute to the planning for and running of the department for which he is responsible. In short, if the director works with his teachers in such a way as to earn their respect, and to be received cordially when he appears in a shop, the co-operation of his teachers is assured.

8. The janitor or custodian:

Some directors make the mistake of ignoring the janitor on grounds that he is a lower order of being whose proper place is in the boiler room. It is true that certain of his duties are performed in the basement; every once in a while he emerges for the purpose of helping the teacher, the principal, or director over some difficulties that arise in the school. During these periods he may be a powerful ally, or a retarding force, depending upon the relationship existing between him and the individual who needs help. If the director has made it a point to obtain the co-operation of this important member of the staff a way can always be found to get things done. On the other hand, if the will to co-operate is absent, it is surprising how little can be accomplished. Tools disappear, equipment goes out of order mysteriously, and misunderstandings are constantly arising.

Then too, the janitor is a public citizen and enjoys the freedom of speech common to all Americans. When he leaves the school in the evening he can do much to promote among parents an understanding of what the school is attempting to do, or he can misrepresent what he sees in the school shops as a definite waste of public funds.

Here again, the janitor is human and reacts favorably to the ordinary courtesies expected by humans. He has a right to feel that his job in the school is as important as that of the teacher and director. Like the teacher he likes to be consulted on matters that affect him, and he appreciates it when someone gives some consideration to his work schedule when classes are being arranged.

Those that belong outside of school:

While it is important to establish co-operative relationships with those who are employed within the school, many of the director's plans can be expedited if he has the co-operation of people outside the system.

1. Luncheon Clubs:

As a matter of policy the director should belong to one of the local luncheon clubs. As a member he will have opportunities to become acquainted with the business people in the community and thus be in a position to gain their support in his efforts to develop his program.

The contacts made through this agency should simplify the task of arranging op-

portunities to discuss vocational education before other luncheon clubs.

2. Labor unions and manufacturers associations:

Both of these groups may be valuable allies or formidable enemies, depending upon the type of program being offered and upon the extent to which they are informed about it. Because of this it is extremely important that the director be known and respected by the leaders on both sides.

There is no antagonism between the representatives of these organizations in so far as vocational education is concerned. Both are interested in developing better workers and both have shown by their actions in the past that they will support any legitimate effort to provide effective vocational training. In view of this it is desirable that the director be willing to benefit from their ideas and to keep them informed on what is being done in the school. This may be done by means of talks before the organizations or by having representatives visit the schools to see classes in operation.

Whichever plan is used the director should definitely plan to keep his program prominently before workers and employers in order that he may earn their confidence and support.

3. Women's organizations:

As the years go by, more and more, the influence of women on public affairs is being felt. Women are taking their places in politics, in school affairs, and in business. If the director can gain their interest in his school program they can do much to aid in its promotion.

Women are interested in providing equal educational opportunity for all youth. This interest can be enlisted in the cause of vocational education provided the director can gain their confidence and can convince them that the program he represents meets a definite need in the community.

In order that he may do this it is important that he seek opportunities to discuss his work before the organizations to which the women belong.

Conclusion:

It is not to be assumed that even if the director has the active co-operation of all of these individuals or groups he is assured everything he asks for. The extent to which he is successful will depend upon the soundness and reasonableness of his aspirations, together with the effectiveness with which he can enlist the support of others. If he is careful about the first of these, realization of the second is simplified.

Publicity an Aid in Vocational Education

The question of stimulating and maintaining interest on the part of others in the work of his department is one of the important responsibilities of the director. Public support does not come from sporadic appeals made at the moments when support is needed. It comes when needed only as the result of a long-time program by means of which those from whom aid is expected are kept informed of the aims, objectives and achievements of the department. School administrators and members of the public must be in constant touch with what is being done in the department and what is planned for the future. By this means an interest is created and a desire to help the program is built up.

There are various agencies through which the director may work to develop local interest in his department. Among these are the following:

The City Superintendent of Schools:

The superintendent is responsible for the whole school system. When a director is appointed for any special field the superintendent delegates certain functions to him which, in a smaller organization, would be performed directly by the superintendent. When this is done the chief administrative officer is cut off from direct contact with the department concerned, and he must rely on the director to keep him informed. If the director fails to do this, and the superintendent is not aware of what has been transpiring, it becomes embarrassing to him when he is called in to help when trouble develops, or when a citizen begins to discuss matters pertaining to a department with him and he is compelled to admit his ignorance.

The director who places his superintendent in a position of this kind cannot hope to get his support when it is needed. In order to avoid such a condition the director should make periodical reports directly to the superintendent on what is being done and what is planned. Any item of interest concerning a teacher, a pupil, or a piece of work should be submitted. These reports should be in writing, they should be brief, but they should be frequent enough to keep the department before him.

The fact that he has not asked for reports is unimportant. The fact that he may not mention them after he has received them is just as unimportant. The only thing that counts is that he has a feeling that he knows what is going on and is in a position to talk intelligently about it.

These reports simplify the task of the superintendent since he, in turn, can report progress to the board, or he can discuss departmental work with members of the public. In other words, he is placed in a position where it is possible for him to discuss departmental affairs intelligently wherever the need arises.

These reports need not be formal in character. They may be merely memoranda calling attention to some departmental matter in which he may have a special interest. If he desires further information he will probably ask for it. If he drops the memorandum in the wastepaper basket it has still done its work.

Added to these informal reports more formal ones are likely to be asked for from time to time. It is likely, too, that these latter reports will form the basis for other reports which the superintendent may have to present to his board or to the State Department. When these are being prepared it will be helpful if the director finds out specifically what his chief must have in order to satisfy those to whom these reports are made. This information should be prepared carefully and accurately and should be set up in a form so that it can be readily interpreted. After this is done there should be added any additional data or information which the director feels should be of interest.

Associates on the Same Administrative Level:

The progress of any department depends in some measure upon the extent to which the staffs in other departments understand what its objectives are. For this reason the director should appreciate the necessity for presenting the general phases of his work in staff conferences, and in meetings of special supervisors. This will spread the gospel among other departments and may reveal opportunities for co-operative effort between them. If there is a mutual understanding between the heads of departments the problem of gaining support from them when needed is minimized materially. In addition to this it makes for closer co-operation between departments when the director submits to his associates on the staff copies of all instructions, instructional material, and bulletins for their criticism and suggestions. This provides the director with professional advice, and tends to unify procedures and policies in the school system. Furthermore, it develops the practice of the staff working together rather than as independent and unrelated units.

The Principals:

The principal is responsible for his school and for those who teach in it. Because of this he formulates the policies for his school in conformity with the general policies of the school system.

The director is an advisor to the principal in matters pertaining to his special field of work. If the support of the principal is expected it is important that he be aware of all departmental policies, orders or plans in so far as they affect his school. In order to bring this about the director should seek opportunities to discuss his field before the meetings of the principals with a view to assisting them in deciding upon policies to be applied to that field.

This recognition of the place of the principal in the picture will tend to secure his co-operation in working out any plans the director may have in mind.

The School:

The department may be brought to the attention of pupils, teachers, and parents if the director follows the practice of co-operating with other departments in assembly-room activities, plays or pageants, in building equipment, or in organizing school exhibits.

Care has to be taken to prevent some school people from assuming that the industrial department is merely a place where things can be made. However, if these activities are directed properly they may become valuable as general school activities while at the same time building up an understanding and an appreciation of the departmental objectives.

Then, too, a great deal can be done through appropriate and timely articles in the school paper. These articles should be written by the pupils and they should be guided by the shop teacher. They might be edited by the pupils in English classes through the co-operation of the English teacher.

The school paper might be used also as a means of disseminating information or news about the department or the pupils who are doing work on it.

The display board or the showcase in the school halls are excellent means of informing both pupils and teachers concerning what the department is doing.

These and other means of publicizing the department should be used constantly by the director. He cannot assume that because he is conscious of what is being done and of its value in the school program that all others are concerned with its importance. He must tell the school population and he must keep on telling them.

Parent-Teacher Association:

It is not sufficient to tell the teachers and the pupils about it. The parents must be made conscious of the work being done and the reasons for it. This may be done through talks before the association given by the director himself or by the teachers. Then, too, demonstrations may be given by the teachers or the pupils, or the members of the association may be invited to an open night in the school when they may have an opportunity to see the whole department in operation.

Professional Meetings:

In most states there are various educational organizations. One is likely to find a state teachers' association, a principals' association, or an association of city superintendents. The director can do a great deal to keep his department before school people and to develop a better understanding of it, if he is to have his field represented on the programs either personally through members of his staff, or through a speaker from outside the state.

By this means it is possible to develop in the minds of educators a consciousness of the work he represents and the part it plays in the complete school program.

The director who remains in the background, and who fails to make use of these opportunities for gaining publicity, cannot hope to gain the respect and the support of others in his efforts to develop his department in harmony with other areas of school activity.

The Press:

The director should endeavor to have the co-operation of the local press. Newspapers are always on the alert to find items of local interest for publication. If the proper contacts are made a steady flow of articles may be accepted provided they are written in a manner that makes them of general interest. School exhibits, interesting projects, co-operative efforts on the part of classes to contribute to the school equipment, all make interesting reading. Mrs. Jones likes to read in the paper that her Bill has been responsible for carrying out some special assignment in the school shop. Whatever it may be, if it appears to have general interest, it is suitable material for the local paper.

Since newspapers have a particular style in setting an article up it has to be kept in mind that whatever is written should be prepared in co-operation with the news reporter and should be written from a human interest standpoint. If the director has the reporter on his list of friends the problem of securing newspaper publicity is simplified.

To gain favorable newspaper acceptance the director should keep the following points in mind:

1. Newspapers have a deadline. Find out when it is and see that your material is delivered in time.

2. Always typewrite your material, double space, and use only one side of the paper.

3. The headlines are not your responsibility; leave room at the top of the first page for it to be inserted.

4. Your material should be timely. Newspapers are not interested in "old stuff." They want to know what happened *today* or is going to happen soon.

5. Good action pictures are always desirable.

6. Be sparing in the use of the director's name. The name of the superintendent and the state board for vocational education cannot appear too often. Similarly, the names of specific pupils and stories about them make good reading for the public.

7. In writing publicity material, and over and above the idea of giving credit where it is due, one should keep clearly in mind that the primary purpose of publicity is to inform the public about vocational education as it is carried on in the school, to convince the readers that money spent on this type of education is well spent, and that further development of this department is in the public interest.

Local Manufacturers' and Labor Organizations:

Both employers and workers are interested in vocational education provided it does not violate the principles for which they stand. In order that their co-operation may be assured the director must seek opportunities to appear before different groups for the purpose of making clear to the members of both groups what the aims and objectives of vocational education are. If the director makes clear that his sole mission is to help the worker become a more efficient worker, and to provide him with opportunities to progress in his occupation, his job of informing the public will be greatly simplified.

Work Exhibits:

Members of the public have no means of knowing the quality of work produced in vocational classes unless the director makes a definite effort to bring samples to their attention. Exhibits of work may be built up and kept on display in the school, or, they may be displayed in store windows in the business section of the city.

Another plan is to open the school shops to the public so that citizens may actually see the pupils at work. This plan may be used also to inform special groups such as Rotary or Exchange clubs, the labor unions, or the manufacturers' associations. In the latter cases special invitations are issued to specific groups who attend in a body.

Satisfied Students:

The best medium for gaining publicity is a group of students who are satisfied that they are receiving instruction which they can recognize as being worth while. All other publicity efforts become useless if the pupils spread the gospel of dissatisfaction. This suggests that the director must actively concern himself with the question of what is going on in the classes. This is the root of the whole publicity campaign. If the root is bad the whole tree will be barren.

Advertising Evening Classes:

As a rule evening classes are intended for adults or for young people who have left the all-day school and have started work. Those individuals who attend evening school; and who wish to increase their skill or knowledge in their present occupation, are considered to be eligible for entrance into a vocational class.

Unfortunately, many of them lack confidence in the school and are likely to feel that there is no connection between it and their job. If the evening school is to give adequate service to the community this feeling must be removed. All of the agencies discussed in the foregoing paragraphs can be used in doing this but the following additional suggestions may also be helpful.

1. The director should have a wide range of acquaintanceship among the industrial leaders and personnel men in his community. These individuals can provide many opportunities for spreading information about classes. Furthermore, if they have confidence in the director, and are convinced that the evening program will help the worker on his job, they are likely to become active in promoting it.

2. Notices posted on the factory bulletin board are helpful. These may be followed up in many cases by a mimeographed letter to some of the influential workers in the plant.

3. The co-operation of the local unions should be sought, and an effort should be made to discover from them how the eve-

ning school may best serve their trades.

4. Illustrated bulletins, describing the courses, should be distributed widely. It is good policy to have these designed to fit into a man's pocket.

5. Evening-school students are likely to be attracted to a building that is well lighted. Furthermore, they like to be where there is a crowd. For these reasons adequate illumination is necessary and classes should be arranged so that the students are massed. In other words, it is better to have two nights with the rooms filled than to have the same number of students spread over five nights.

6. The most effective publicity for any class, night or day, is to give the students something that they recognize as being of value to them. If this is being done the director will have little difficulty in getting information about his classes to others.

This suggests that, while the director must be on the alert constantly to publicize his work, he should not neglect to assure himself that the instruction being given in his department is of a type that will induce the students to tell others about it.

The Expanding Function of Co-operative Education

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It is no longer generally necessary to attempt to justify the educative value of co-operative work programs in education, as was the case until relatively recent years, for clearly co-operative training has proved its usefulness in a wide variety of vocational areas. In connection with its rapid development, it may be of interest to note briefly the evolution of work experience for youth. Some of the implications of co-operative work, particularly in the secondary schools, and the reasons why it has come to be especially needed in our present social structure provide an interesting side light on our present efforts in seeking to make co-operative work experience available as specific vocational preparation.

Work in Relation to Our Early Schools

Although work has traditionally been a major part of life — whether we prefer it that way or not — it has not, until relatively recently, been given serious consideration in planning education. Actually, the educational laws in the American colonies in the early days specifically stated that children should be trained by their parents in some useful occupation. It was presumed by our founding fathers not only that work was necessary for the individual, but that his proficiency in some useful occupation was essential to the welfare of the community as well. The supervision of this work experience was as a matter of convenience left in the hands of parents, since the wide variety of occupations possible which could be taught at home or in a near-by shop made any direct school supervision or classroom work instruction impracticable.

As our civilization became less generally rural, it was less frequently possible for parents to give their children work instruction since they were no longer working at home, and many of the simpler manual crafts were no longer needed. Work thus came to be more definitely separated from a child's normal process of growing up, and usually it represented eight or more hours of labor in varying degrees at a place of business some distance from home. As a consequence, the more fortunate children devoted their energies to various play activities, and were protected by most parents who could afford to do so from the harsh realities of work aside from household duties and less confining short-hour jobs.

Providing Work Opportunities

This solution has not adequately met the problem of introducing the child to work, with the benefits and responsibilities work can provide as an integral part of his education. In some manner, adequate work opportunities must be provided. Who shall provide them? A few years ago, a committee appointed by the American Council of Education made a study for the American Youth Commission on the secondary school curriculum. In recommending that work experience be included as an essential element in a general education, and that a more favorable social attitude be taken toward work, this report suggested five ways in which such experience can be provided:[1]

1. Some families can provide work opportunities.
2. Youth may develop opportunities for work through individual inventiveness.
3. The school may provide certain limited opportunities for work directly in shops and homemaking laboratories. The school can cooperate with other agencies in organizing opportunities for productive labor.
4. Private employers may engage young people to work as learners while they are being trained for full employment.
5. The community, the state, or the Federal Government may provide employment opportunities on public works.

[1] "What the High Schools Ought to Teach," American Council on Education, 1940, p. 17.

The first two of these possible work opportunities are more readily possible in rural situations than in the city, though in the latter situation co-operative groups have sometimes made useful work opportunities for themselves. Schools have not generally been able to provide directly many opportunities for work except in clerical jobs, since most productive employment requires equipment and facilities not usually available to them. There are, of course, other objections as well. During the war, various types of work contributing to community and national welfare, such as salvage and waste paper collection drives have been carried on by high school young people, yet generally the thought of working at no pay even though for the public good is not an especially popular one.

Work provided by private employers has been commented on frequently in the educational press, and is becoming more and more widely used. It is interesting to note that in the report referred to, what we think of as co-operative work opportunities was only one of the means of providing work experience, whereas many today think of it as the only one. Examples of work opportunities provided by government include the CCC and the subsidy plan of the NYA, both the cause of extended controversy while they were in operation.

Scheduling of Work Experience

One of the various criticisms advanced against more work experience for high school students has been that it takes time

which conflicts with regularly scheduled classes and other school activities. Similarly, one of the deterrents to prospective employers has been the limited hours at which students were available for co-operative employment in many communities. One of the sacrifices schools will doubtless have to make if work experience is to be utilized to its fullest as an educative experience is to radically revise school schedules so that students can work at times more desirable to employers. This would represent a considerable innovation for many schools, and might make teaching hours less desirable than they are now. It has been done in many schools, however, and if work is as important as those of us in co-operative education believe it is, such a change may prove a necessary one.

To quote again from the American Youth Commission study:[2]

> Those who are to enter the professions need to labor at some period in their lives in order to gain an understanding and appreciation of what labor is. Those who are going to earn their living by labor have a right to be trained under competent supervision so that they may enter on their careers under the most favorable conditions possible.

[2] *Ibid.*, p. 20.

There is still much to be done if co-operative work programs are to provide as valuable an experience for youth generally as is potentially possible. Those of us who work in fields of vocational and co-operative education are in a position to observe closely the good and bad features of work experience as organized at present, and are in key positions to devise the improved techniques needed if work is to take its proper place in the educative process.

The Principal Visits The School Shop

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Principals of elementary schools, junior high schools, and senior high schools, except those few who have had shop training or experience, seem to have a tendency to avoid supervisory visits to the shops in their schools. Because of their unfamiliarity with shop techniques and skills, they fear the embarrassment that their ignorance might bring upon them. If these principals had spent a little time in their shops as observers they could soon acquire a sufficient smattering of knowledge to make it possible to view the shop scene intelligently.

But even lacking this knowledge there is no reason why they should hesitate to make supervisory visits to the shop. For the principles of education as they have employed them in the classroom apply equally well in the shop. The supervisor may be completely ignorant of shop techniques and still be able to evaluate the work of the shop teacher.

Visiting the School Shop

Let us visit a good shop and see what there is to see. On entering the room we encounter the ordinary noises of tools applied to materials. In addition there is a low hum of conversation. The latter disturbs us at first but on listening in on some of the conversation we find that it concerns the work of the shop. If the conversation has to do with matters foreign to the shop, then we know that the discipline is not good.

Each pupil wears a clean apron. He is busy with his job and stops his work only to ask the teacher or a neighboring pupil a question concerning it. When we find a number of pupils loafing apparently with nothing to do or no materials on his bench with which to work, the teacher is at fault.

We look around the room and find that the teacher's desk is orderly, that no junk is piled on top of cabinets, that the lumber and metals are stacked neatly in their racks and that the tools are arranged methodically in their cabinets. The waste materials on the benches and floor are only the accumulation of the work of the present period and not the leftovers of previous periods or days. These are the symptoms of good housekeeping such as any good supervisor should be able to spot and recognize immediately.

The teacher espies us as soon as we enter the shop and comes toward us with a smiling face and an outstretched hand, which we note, is clean. His clothes are neat and unspotted, his shoes are shined, and he wears a shop coat unsullied by the grime of weeks of use. His greeting is clear and distinct and his voice is well modulated. When he leaves us to return to his pupils we note his friendly attitude toward them and the warmth of their affection for him. We see no outbursts of temper or undue punishment of pupils resulting from such outbursts.

Outline of Course and Lesson Materials

His course of study can be found in an upper drawer of his desk. It is bound within clean covers and the marks of thumb prints do not deface its pages. Its practical applications are to be found in the plan book which lies in an accessible place on the top of the desk. We riffle the pages of the plan book and when we reach the page referring to the present day's work we note that it outlines the very work upon which the pupils are engaged.

Each pupil has a blueprint on his bench. It contains a working drawing of his project together with a list of materials necessary for its construction and a description of the methods required for its construction. A finished model of the project is displayed. On the walls are charts and other instructional materials pertaining to the work of the shop. These are clean and without frayed edges indicating that they have been hung recently. In the cabinets we find other charts and instructional materials which were formerly displayed or will be displayed at some future time. The blackboards are clean except for an unsmudged drawing of some details of the work in process at the present time.

A pupil brings a finished project to the teacher for his inspection and approval. The teacher examines the project carefully and seriously, administers praise where it is due, and points out faults in a friendly manner. He then makes a notation of the quality of the job in his record book. This book also contains the records of attendance, an inspection of which will disclose that the attendance of the present class has been recorded.

The teacher blows a whistle. Immediately all work stops and conversation ceases. He groups the pupils around a workbench to give a demonstration, a safety lesson, or to explain some related work. Before beginning he makes sure that each pupil is in a position to see and hear him. A humorous remark places the pupils in a pleasant frame of mind. Here, the supervisor can use the same criteria of judgment as he would in a classroom.

The Demonstration

On the demonstration bench lie all the tools and materials which are to be used in the lesson. The teacher announces the topic and the purpose of the lesson and its connection to previous lessons. He discusses the tools and materials which are new to the pupils. As the lesson goes on he calls on pupils to participate in the demonstration. His questions are framed so as to elicit responses beyond the "yes" and "no" type. Occasionally a pupil asks a question, which is referred by the teacher to another pupil to answer. The problems of accident prevention are woven into the lesson so that the pupil learns of the necessary safety precautions as each new process, material, tool, or machine is presented to them. At the end of twenty minutes the lesson closes and the pupils return to their stations.

Shortly afterward the teacher blows his whistle again and announces the end of the period. Monitors quietly collect the tools and materials and put them in their proper storage places. The benches and machines are brushed clean of chips and dust. Then a second whistle is blown after which the pupils form in line and file out of the room in an orderly manner.

The foregoing is a word picture of an ideal teacher working in an ideal shop with ideal pupils. Those of us who have had experience in the supervision of shopwork know that this is a combination which is infrequently found in our schools. We have encountered all of these ideals individually but rarely collectively. What can we do to make all of these ideals possible? A good supervisor can do much in this respect.

A new teacher comes to us with an already formed personality. He has had practical training in the techniques of his craft. In addition he has had pedagogical training. Finally he has passed an examination and received a license which authorizes him to teach in our schools. But he has had little or no teaching experience. It is here that the supervisor finds his opportunity to do missionary work. The first few years of the teacher's life in the schools are the years which count in his growing process and unless he receives patient, sympathetic guidance during that period he will never aproach the ideal we seek.

The Teacher and His Teaching Load

We must not burden the shop teacher with too many extracurricular assignments for he has quite enough to keep him occupied in his own shop, such as the preparation of teaching materials, maintenance of tools and equipment, and preparation of stock for the use of his pupils.

Nor must we burden him with too many pupils. Every shop has a fixed capacity. A registration beyond this capacity means that some pupils will have no working places and will therefore have to be crowded in with other pupils. There are certain inherent hazards in connection with the use of shop tools and machines. Crowding multiplies these hazards. Furthermore, since shopwork is best taught on an individual basis, too many pupils makes it impossible for the teacher to find sufficient time to make individual instruction possible.

We must give him a good shop in which to work. The room should be sufficiently spacious to accommodate a maximum of 25 pupils. It should be of good proportions and free from nooks. It must be provided with good daylight as well as artificial light. The equipment should be adequate in quantity as well as in quality. There should be ample pupil working space so that each pupil will have the elbow room he requires to avoid interference with and by his neighbors. Consideration must be given to storage space for tools, raw materials, projects in process of construction, and finished projects.

Since education is compulsory in this country we must accept every child in our schools who is eligible for school training and, since industrial arts is an integral part of the school curriculum every child has a right to partake of the instruction in the school shop, be he intellectually normal or subnormal. However, since each of these intellectual types requires different teaching methods and projects, efficiency dictates that they be grouped in separate classes. And since subnormal children require more personal attention it is imperative that their classes be much smaller than those for normal children. There are some educators who advocate nonsegregation on the ground that subnormal children will be spurred to better work by the incentive of the work of normal children. They fail to take account of the limited capacity of most subnormal children, who may easily become discouraged by their inability to attain the skills which are possible to normal children.

Finally, there should be a concord between the supervisor and the teacher which will make for good personal and professional relations. Each should have a sympathetic attitude toward the other's problems. We should all keep in mind that the schools exist for the education of the children and not merely for the purpose of creating jobs for us.

Productive human work for the peoples of the world is a basic requirement for any enduring peace. May it be repeated and emphasized that as men work so they are and become. This is more than a bit of rhetoric. It expresses a human realism, determining the quality of life, liberty, and the pursuit of happiness. — *Edward C. Elliot.*

Train your mind to mind the train. Grade crossing accidents killed 2074 people last year.

Choosing a vocation, Hadley Technical High School, St. Louis, Mo. Submitted by Warren K. Begeman, Director, Technical Education and Industrial Arts, St. Louis, Mo.

Health Hazards While Working With Metals

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Exposure to Molybdenum: The growing importance of molybdenum in industry has been partly due to the peculiar property which it imparts to iron and steel when alloyed to the extent of 2 to 4 per cent. Many new uses have been developed during World War II. Molybdenum — a hard, silver-white metal — is particularly suited for use in tool steel. Molybdenum steels are less brittle than the tungsten steels and can be more readily turned. It is usually added to steel as a rich ferro or manganese alloy of 50 to 75 per cent molybdenum or is added to the furnace charge as calcium molybdate.

The U. S. Public Health Service, by Fairhall, Dunn, Sharpless, and Pritchard, have checked the toxicity of molybdenum. Here is the conclusion of their experiments: While molybdenum is less poisoning in general than several other metals of industrial importance, it is suggested that suitable protection should be insured against the inhalation of any considerable amount of the more soluble molybdenum compounds. A useful means of estimation of the extent of absorption of molybdenum is indicated by examination of the blood or urine for its molybdenum content.

Here are some other industrial uses of molybdenum as mentioned by Fairhall and his associates. In resistance furnaces molybdenum steel alloy wire is said to be very effective in producing a high temperature in a short time. Bank vaults of molybdenum steel are reputed to become harder on aging so that a drill will scarcely scratch them. Some of the alloys have been recommended as substitutes for platinum. Molybdic oxide has been used as catalyst in the synthetic production of ammonia from hydrogen and nitrogen. In the chemical industry the largest field of application is in the production of pigment colors for printing inks, lacquers, paints, etc. Molybdenum colors are noted for their permanence, brilliance, and great tinting strength. In the electrical industry molybdenum wire has been found to be especially valuable in hydrogen furnaces owing to its high melting point (above 2600 deg. C.). In the radio industry it has proved most useful and as a result practically every modern radio receiving tube contains metallic molybdenum. These varied uses of molybdenum, Fairhall says, together with the large amount of the metal consumed in industry indicate that a relatively large group of workers must be potentially exposed to it in one form or another.

Autogenic and Electric Welding: The Scandinavian author, Eiler H. Schiötz, in a report in *Acta Medica Scandinavica*, gives a survey of poisoning and other occupational diseases among welders. Those diseases among *autogenic welders and burners* may be due to (1) impurities and unrefined acetylene, phosphoretted, arseniuretted, or sulphuretted hydrogen; (2) gases evolved in the welding flame: nitrous fumes; (3) vapors or gases from the metal which is being treated: metal oxides (especially oxides of lead and zinc), acrolein, carbon monoxide.

Poisoning or other occupational diseases among *electric welders* may be due to (1) inhalation of *welding smoke* which consists of (*a*) gases from the arc flame (nitrous fumes) mostly in infinitely small quantities; (*b*) vapors from the electrode metal and from the coating of the electrode (oxides of iron, manganese, calcium, fluor, titanium, etc.) Siderosis of the lungs has not infrequently been noted among electric welders. Signs of irritation in the upper air-passages and digestive troubles are often prominent features; (*c*) vapors from the metal which is being welded (as in autogenic welding); (2) rays from the arc flame: especially ultraviolet rays, which give rise to *electric ophthalmia*, a disorder frequently occuring among electric welders — *welder's blindness*.

Plumbophobia — Fear of Lead: Dr. Wm. C. Wilentz is convinced that the lead industries have been on the defensive far too long and unnecessarily. The unfair and insidious propaganda which caused this situation has been permitted to permeate throughout the entire field of industry, government circles and courts of justice, and has, therefore, placed the entire industry in a very unfavorable position. This is due primarily to the fact that too many men have written and are now writing too many books and articles about lead of which they know too little from a practical standpoint. These men, either innocently or by intent, are responsible for this condition which I term *plumbophobia*, meaning *Fear of Lead*.

Such fears, Wilentz says, may have been justified some years ago, but they are not justifiable now. Industry is spending huge amounts of capital to install the most modern protective equipment as well as providing the services of well-trained physicians and modern medical dispensaries to deal with anything that may arise in the course of employment including the effects such as they may be from exposure to lead.

It is Wilentz's belief that cases of lead absorption and intoxication should recover without any resulting disability. This is predicated on the fact that if sound medical observation and treatment are provided in conjunction with present-day co-operation from management excellent results can be obtained. "Let's not continue to consider lead absorption and intoxication as 'an incurable disease.'" Wilentz recommends highly the excellent pamphlet published by the American Public Health Association entitled, "Occupational Lead Exposure and Lead Poisoning," which can be used as a reliable guide to the treatment of lead troubles.

Lead Poisoning by Inhalation: Lawrence H. Cotter, Columbia University, New York City, has seen many cases of lead intoxication by inhalation, and he describes 10 cases in most of which painted steel had been burned. The typical victim of lead poisoning by inhalation, according to him, is a middle aged man who has been exposed from one to three months. If his exposure is intermittent, his symptoms are less marked; if it is his second exposure after an interval of years, his symptoms are more pronounced and the factor of muscle weakness suggests the common picture of ingested lead intoxication to a greater degree. Wearing of a positive pressure respirator should be mandatory wherever a blowtorch is used to cut painted steel.

T. E. P. Gocher sees special danger of lead poisoning where burning of lead-coated metal is undertaken. Inhalation of lead may produce symptoms within hours; ingestion will require about two weeks, and contact through the skin about two months. Areas of particular attack are the nervous system, gastro-intestinal tract, or joints. Plumbism may cause a nerve type poisoning with little of the typical red cell picture, a liver type with a marked red cell picture, or a combination of the two. For industry Dr. Gocher recommends periodic stipple cell counts, protective breathing devices, shop cleanliness, and good personal hygiene. Prevention is stressed as the best approach to chronic lead poisoning.

Six per cent of all drivers involved in fatal traffic accidents in 1944 were youngsters under 18 years of age. — *National Safety Council.*

Industrial Arts and Vocational Education

John J. Metz, Editor

THE NEED FOR AN ADJUSTMENT

The shortage of qualified teachers of industrial arts and vocational education is still acute. Some of it, if not most of it, is due to the fact that the beginning shop teacher, even though he has to have at least a bachelor's degree from a reputable teacher training institution before he can hope to get a teaching position, is expected to start at a salary that is lower than that of the average semi-skilled worker in industry.

Under such conditions it is quite understandable that there are less and less eligible candidates for the teacher training schools. It is also understandable that there are more and more teachers who choose to leave the teaching profession and take up other work which pays salaries that permit a standard of living that is in keeping with the amount of time and money expended to acquire the training required to prepare oneself for the type of work chosen for a livelihood. During the past few years, more than 350,000 qualified teachers have thus left their profession. To fill their places, less qualified persons have had to be chosen to fill many of the positions, especially since starting salaries are uniformly low.

It is quite important that something drastic be done about teachers' salaries, especially for those who are engaged in teaching technical and practical subjects. The teachers in the fields of industrial arts and vocational education must not only be able to teach, but they must also possess the skills practiced by those working in the trades. Some of these teachers are quite capable of teaching several different kinds of the more common trades. Many of them are capable of holding positions as artisans, foremen, and executives in the building and automotive trades, the machine trades, distributive trades, and the printing trades. Teachers who possess such training need not go begging for a job. Either the school does something to retain them or they will seek more attractive incomes.

The remark is often heard "Teachers want a twelve months' salary for ten months' work." No doubt that is one way of looking at the situation, but the fact is that the salary for the ten months represents the teacher's income for the year. Teaching is not a part-time job. The teacher does not set the length of his work year. That is set for him.

Probably he can add to his teaching income by working during the summer months, but that is merely accidental. In many school systems, teachers are expected to attend summer school during their vacation. As a matter of fact, promotion is often based on such summer school attendance. The annual salary, therefore, is to be looked upon as the teacher's income for the year. As it is now, it is much too low, and if America wants its children to be given a worth-while education by well-qualified teachers, it must see to it that these professionally trained men are paid salaries befitting their exalted calling.

PLANNING FOR VACATION

The children attending school are eagerly looking forward to the summer vacation. That is natural and to be expected. The very fact that they can more or less do as they please during the summer months causes this youthful joy. Unfortunately, children do not possess the needed judgment to decide for themselves just how far they may go in the use of their freedom. They do not even know how far they may go in using up their own energies. They lack experience and when they are not supervised they overdo, or apply their energy in a way that brings them into trouble with the law. That is why we have more juvenile delinquency, and more vandalism in summer than during the school year. These facts are known. Can something be done to change this? Can this problem be solved?

Such a solution will not be found easily. At any rate, it will never correct the evil 100 per cent. Examining what has been accomplished by some cities, may, however, indicate a line of action that will accomplish something in reducing the summer toll of accidents — fatal and otherwise — the numerous cases of vandalism, and the many charges of delinquency that are piled up during every summer vacation.

Supervised playground activities, handicraft programs, nature study groups, all have been tried out, singly and in combination, by some of the larger cities. They reach a small number of juveniles, and with these they are quite successful. What can be done to reach more of the youngsters? What can be done to present more supervised summer activities that will attract a greater number of those who need them most? Can the number of city school systems who offer any kind of supervision for children during the summer months be increased?

All of these questions clamor for an answer. Can the individual teacher help solve them? Probably there is still time to lay plans. Ordinarily the instructor gets his orders from the top down. It may be possible that the teacher, being nearer to the child, may be in a position to help those at the top formulate more effective means of overcoming the dangers which beset our youth.

Shop teachers are known as men who can tackle difficult problems. Here is something that deserves their best efforts.

INTERESTING BITS OF INFORMATION

Interesting facts about the use of an everyday product always attract attention. An item in *Steel Facts* published by the American Iron and Steel Institute, itemizes the many different kinds of steel that are used in producing a typical 25 h.p. tractor manufactured by one of the large tractor firms. The total weight of steel listed does not include the weights of standard steel parts, such as bolts, nuts, lock nuts, and rivets, but in spite of this it amounts to the appreciable quantity of over 1500 pounds of steel.

This total weight of steel is made up of about 402 pounds of hot rolled bars, 226 pounds of cold rolled bars, 423 pounds of sheet and strip steel, 58 pounds of terneplate, 14 pounds of wire, 14 pounds of plate steel, 50 pounds of billets, 315 pounds of alloy steel, and 17 pounds of stainless steel.

The foregoing gives one but a slight picture of the total amount of materials that are used in the construction of a small tractor, but it does show the diversity of one of the materials — steel — that is needed. Information of this kind is extremely interesting and may well be used to enliven the more or less uninteresting information given to the student to accompany his shopwork.

Inherent Therapeutic Values in Industrial Arts

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This article attempts to: (1) indicate the scope, and to show the results of man's mental-emotional deficiency in this country; (2) point out some of the causes of this deficiency; (3) describe how industrial-arts subjects are used as an adjunct to the healing art of the mentally ill; (4) point out wherein lies the inherent therapeutic importance of industrial-arts subjects; (5) denote how this knowledge gained from the study of the therapeutic effectiveness of industrial arts in institutions of the mentally ill could also be used in the school industrial-arts classes to the great benefit of our students.

The Somber Backdrop

Not long ago a group of English statisticians meeting with the British Academy of Medicine issued a startling report which said in substance that "if mental disorders continued to increase at the present rate the last spark of sanity would die out of the civilized world in the year A.D. 2139." This catastrophe will overcome mankind in less than two hundred years, if nothing stops its progress. This gloomy prediction, coming as it does from people who are notoriously self-possessed, and who are not given readily to overstatement of facts, is indeed disquieting. This precise forecast of future events points to the alarming fact that the rate of mental disorders is rapidly increasing. This fact alone should bring home to all of us the realization that mental disorders are the concern of every social agency: the home, the church, the society and lodge, the school, the medical profession, and of every individual capable of realizing what his responsibilities are to his fellow man, to his community, and to his country.

Let us look at this problem in more specific detail before we let ourselves be swept off our feet, as it were, by the declaration of the English statisticians. Accurate statistics of mental diseases have been kept only since 1880 in this country. Nevertheless, the facts accumulated during this period tell a startling story. During this period the actual number of the mentally ill detained in public institutions has increased greatly, in fact, much more rapidly than the population as a whole. While in the past sixty years the population in the United States has little more than doubled itself, the admissions to state hospitals for the mentally ill have increased *ninefold*. Assuming that this is the natural rate of growth, what about the future of this menace in the United States? The answer to this question is not bright and cheerful. Statisticians of this country are telling us "that in 1970, only 38 years hence, when the United States will have a stable population of 150,000,000 there will be 950,000 mentally ill patients in hospitals. In other words, with an increase in population of approximately 20 per cent there will be, in round numbers, a 100 per cent increase in the number of mentally ill patients in hospitals."[1] Professor Brown of Kansas University has estimated "that 5 out of every 100 American citizens will at some time or other be confined in a state hospital because of mental illness, and, since many individuals who should be hospitalized but are not, it is conservatively estimated that an additional 5 out of every 100 are at some time incapacitated although not hospitalized because of mental disease. Thus 10 per cent of the population at one time or another suffer from the severer types of mental disease."[2] Some psychiatrists have suggested that as high as 5 per cent of the population are suffering from psychoneurosis of one kind or another *at any one time*. If we assume the population of the United States as being 135,000,000 in 1946, then 5 per cent of this figure gives us the appalling number of 6,750,000 mentally afflicted persons.

This, however, is not the complete picture. The figures cited above deal primarily with major and near-major mental cases. For this reason hospital statistics do not convey the real story. The vast majority of hospitalized cases are psychopathic or insane cases. Relatively few neurotics are disabled enough to be admitted to mental hospitals. "In Massachusetts, for example, only *one in fifty* admissions to state mental hospitals is neurotic. But it is the hundreds of thousands, probably millions, of neurotics who don't figure in the statistical tables that present the real problem."[3] It is also the crank, the eccentric, the "crackpot," the queer, the fanatic, the uncompromising reformer, and many more deviants from the norm who are not considered in any statistical tabulations of the mentally ill. They may be found in many walks of life: among the young, the middle aged, and the old, even in the schools. Their mental deficiency may not be serious enough to interfere with their occupations. They may and often do pass as normal persons. It is an ascertained fact, however, that many serious mental breakdowns occur in this vast, unexplored, and variously tainted mental group.

The presumably physically healthiest male age group is composed of all men between the ages of 18 and 35 who appeared for the draft. Since this group represents all sections of the population, one may expect the same mental health conditions to prevail in this group as in the population as a whole. What are the facts? Dr. Morris Fishbein in an editorial in *Hygeia* for May, 1945, says, "During 1943 and 1944 almost 9,000,000 boys called by the Selective Service were examined to determine their fitness for military service. About 3,000,000 were rejected. . . .

Throughout 1943 and 1944 there was a continuous rise in the number of men rejected because of neuropsychiatric conditions. This does not mean that we began having more people with psychiatric disturbances as time went on. It means rather that the army found methods of examination which were more efficient in detecting people who had psychiatric disorders or who would be predisposed to mental breakdown. The improved methods resulted in detecting so many of these cases that almost one half of all the men rejected from August through December of 1944 were rejected because of mental disturbances. Psychiatric disorders in general account for 29.5 per cent of all rejections, and mental deficiencies account for another 16.6 per cent." Of all the rejectees 46.1 per cent, according to Dr. Fishbein, were mentally inadequate to serve their country in the armed forces.

[1] White, W. A. (M.D.), *Forty Years of Psychiatry* (New York: Nervous and Mental Disease Publ. Co., 1933), p. 138.

[2] Brown, J. F. (Ph.D.), *The Psychodynamics of Abnormal Behavior* (New York: McGraw-Hill, 1940), p. 5.

[3] The Editors of Fortune, *The Nervous Breakdown*, Doubleday, Doran and Co., 1935, p. 5.

Major General Louis B. Hershey, Selective Service director, testifying before the House Interstate Subcommittee on September 19, 1945, said that of 4,800,000 men turned down for military service, 1,767,000 rejections, or about 37 per cent, were attributable to mental ailments or deficiencies. He also stated that mental disorder was by far the greatest single cause of draft rejections.

These figures, as disquieting as they are, do not convey the complete picture of the mental health of the inductees. As rigid as was the screening process of the induction centers, many potential psychiatric casualty cases slipped through into the armed forces. After they had been subjected to all the dangers and rigors of a military campaign, many of them suffered a mental breakdown, and were shipped home to be discharged from the military forces. "The rate of discharge for neuropsychiatric disability from the armed forces is, as one might expect, somewhat higher — 44.6 per cent of all disability discharges. Neuropsychiatric illness thus constituting the largest single reason for discharges. At the present time, well over 300,000 men have been discharged for neuropsychiatric conditions. An estimated 200,000 a year will swell this total, and these figures do not include the vast number of men discharged for physical reasons in which the emotional component is great, those discharged for ineptness and undesirable traits of character and certain other categories that are heavily loaded with psychiatric problems."[4]

When we consider the age group of less than 18 years old, the picture of mental health of this group is no less alarming "for the evidence is overwhelming that a great many children are in trouble. It is perhaps a fair approximation to say that 5 per cent of the school population at any given time needs help in solving problems of adjustment, in other words, in 1940 about 1,200,000 children."[5] How many schools in the United States are equipped to render effective help to this vast number of children who are in emotional distress? How many children receive any help at all?

Emotional maladjustment is only one complement of the total picture. "If we make our total *reservoir* of future delinquents, mental cases, and ne'er-do-wells around 9,000,000 or 20 per cent of the child population under 18, we shall probably not overstate the fact."[6] Society allows these children to drift along, unadjusted, unadvised, only to swell the already wide stream of the mentally inadequate.

What is the social implication of the status of mental health as revealed by the figures already cited? They certainly indicate a situation which should make even the most optimistic sit up and take notice of this mental health menace which threatens the whole population. When more than a third of the nation is affected mentally and emotionally in different degrees of severity, then surely something must be done about it.

This threat manifests itself in the life of the nation in various forms. Only a few of them shall be named and briefly discussed: (1) juvenile delinquency, (2) the American drug habit, and (3) law violation.

Juvenile Delinquency

Let us consider juvenile delinquency first. J. Edgar Hoover, director of the Federal Bureau of Investigation, in a recent address before the International Association of Chiefs of Police painted a pessimistic picture of the rising tide of lawlessness in the United States. He expressed his main concern in the field of juvenile delinquency. In this connection, he stated that more persons were arrested at the age of 17 than at any other age year. Of all the crimes committed in 1944 in the United States, the following percentages, according to Hoover, were attributable to juvenile delinquents: 15 per cent of all the murders, 36 per cent of all the robberies, 51 per cent of all the burglaries, 62 per cent of all car thefts, and 30 per cent of all the rapes. The upward trend of all crime makes the situation especially alarming. Hoover also stated that the arrests of girls under 18 years of age have increased 198 per cent since 1939, that of boys under 18 more than 50 per cent.[7]

Who is to blame? Everybody and everything: the home, the school, the apathy, selfishness and indulgence of the community, and many more causes of like nature. Is it not possible that many of these supposedly real causes are nothing but minor contributing factors? Why seek primarily and only for external causes? Is it not possible that the source, the fundamental cause of all delinquency lies deeply buried within the delinquent himself? If his mentality is impaired, if he is emotionally unstable, and therefore is unable to reason from cause to effect, or to foresee the consequences of his act, or to control the primitive, surging urges or drives within himself, then surely he will act first and think after the act, or not think at all. This will inevitably lead to behavior contrary to the accepted social norm. Why not investigate this phase of the delinquent's behavior? The internal, psychic, uncontrolled urges may turn out to be the most important contributing factors to the unsocial behavior of the wayward youngster. When we definitely know this to be the case, and the available evidence seems to point in this direction, then only will it be possible to take those rational measures in school and out which will be effective in controlling and directing the internal forces and the external environment of boys and girls, thus preventing the rise of delinquency, and eliminating individual disappointments, frustrations, and social failures.

The American Drug Habit

Let us now consider the second threat to our national well-being, namely, the American drug habit. It is a well-known fact that the American people have geared their lives to high speed. We have not yet learned how to use the intermediate or the low gear in our daily living. We are always in a hurry, always on the go, and when we arrive, then we are hurrying back again — all tired out, exhausted. This high tension living finally becomes unbearable. Relief is frantically searched for, no matter what, only as long as it relieves the tension. Some of this tension relief is found in tobacco. Practically everybody is now smoking: men, women, and children. The consumption of cigarettes, pipe and chewing tobacco, cigars, and snuff is enormous. The intake of nicotine, therefore, must also be immense. Excessive consumption of this powerful drug is bound to affect the neural stability of tobacco users adversely.

It has been computed from the data obtained from the U. S. Census Bureau "that the average daily dose of poison for every man, woman, and child in the United States is found to be as follows: 306 grains of alcohol; 6 grains of nicotine; 6 grains of caffein, 1.5 grains of opium, aggregating nearly 320 grains of dope per day per person. . . . Now it must be evident that the influence of such an enormous amount of chemical poisons must make itself felt in the development of a great deal of nervous excitability, high tension, and in the end the creation of a host of neurotics to crowd our hospitals and asylums and prematurely fill our graveyards."[8]

Law Violation

The third major threat to our national life is the general disregard for law and order. In the same speech by J. Edgar Hoover already cited, he pointed out that one out of every 23 inhabitants in the United States has a criminal record. In

[4] Rennie, T. A. C. Dr., and L. T. Woodward, "Rehabilitation of the Psychiatric Casualty," *Mental Hygiene*, January, 1945.

[5] Carr, L. J., Prof., "Delinquency Control," Harper, 1941, p. 136.

[6] *Ibid.*, p. 141.

[7] An editorial, "The Sacramento Bee," Dec. 26, 1945, Sacramento, Calif.

[8] Sadler, W. S. (M.D.), *Americanitis-Blood Pressure and Nerves*, Macmillan, 1925, pp. 10, 11.

1944 there were, according to Hoover, 6,000,000 persons who had sometime in their lives been in collision with the law.[9]

Let us narrow down this vast field of criminality to simpler and more comprehensive proportions, namely, the motor vehicle code violations. How do the facts stack up in this field? In 1943 there were 23,400 motor vehicle fatalities, and about 800,000 injuries, of which 70,000 involved some permanent incapacity. The direct economic loss, resulting from the 1943 traffic accidents, was estimated at $1,250,000,000. This enormous sum was made up of the loss of wages, medical expenses, overhead, cost of insurance, and property damage.

Of the traffic accidents in 1943, 59 per cent of the drivers involved in *fatal* accidents were violating some traffic law. Breaking down these traffic law violations which resulted in fatal accidents, we find the following specific causes: excessive speed accounted for 17 per cent of traffic deaths; right of way, 12 per cent; under influence of alcohol, 5 per cent; wrong side of road, 3 per cent; improper passing, 2 per cent; disregarding officer or traffic control devices, 6 per cent; other violations, 14 per cent.[10]

These specific traffic law violations resulting in fatal accidents definitely indicate one or more elements of human failure. This human weakness manifested itself either in poor judgment, in the inability to foresee consequences, in heedlessness or in self-assertion. Whatever the nature of the particular human deficiency, the result was death in many instances.

One could go on and point out many other social depredations the source of which may be attributable to mental shortcoming and emotional instability, but the few examples just discussed should be sufficient indices of the vastness and intricacy of the problem. The social waste: physical, moral, and mental is incalculable, and the economic loss evaluated in terms of dollars and cents may surely reach a figure of astronomical proportions.

This then is the somber backdrop which we started out to examine. Somber it is, indeed! What do we see reflected on this backdrop? We see that a disturbingly large number of our people is either "cracked," "near cracked," or otherwise mentally and emotionally disturbed in various degrees of intensity. We can also perceive that this national menace manifests itself in different forms, such as juvenile delinquency, law violation, and in many other antisocial behavior patterns.

[9]Editorial, "The Sacramento Bee," Dec. 26, 1945, Sacramento, Calif.

[10]"Accidents Facts," 1944 Edition, Published by the National Council, Chicago, pp. 21, 40.

What is to be done? How many people are at all aware of the existence of this grave problem? Is the nation apprised by its leaders of "these somewhat frightening evidences of its lack of mental and emotional fitness"? What can the schools, particularly the industrial-arts departments, contribute to the solution of this problem? This question will be discussed in detail in a subsequent section of this article.

In order that we may have a better understanding of the problems raised in the foregoing discussion, we should have at least a working knowledge of the origin and development of mental and emotional weakness.

Origin of Mental-Emotional Instability

There are relatively few fundamental drives the satisfaction of which is craved by all men. They are the purely physical wants, social and personal needs. In order to satisfy these elemental urges, man is in perpetual struggle with nature, with his environment, and with his fellow man. Life is not a bed of roses. It is a tough, dynamic game. Everyone must stand on his own feet and fight his own battles. Only the one who is able to make the necessary effective adjustments to life will survive this struggle for existence mentally and physically unimpaired. Success in this struggle will result in the development of a tough moral, mental, and social fiber.

Alas, not all people are able to control and to direct effectively the process of adjustment of their biological organism to the physical and social environment. Some were not endowed by nature with tough enough fiber for successful survival. Because of this innate weakness, they are subject constantly to the many upsetting problems of daily living. They are endlessly exposed to annoying, petty fights and struggles against the hostility of others, and to the many different competitive situations arising in the course of making a living. Theirs is a large measure of denial, frustration, and disillusion. The feeling of self-importance, one of man's most cherished possessions, may be, and often is, deeply wounded by unfeeling and unthinking rivals in this struggle for the good things of life. Insignificant as these problems may be in and by themselves, taken together, and over a period of time, they produce a deep, impressive, cumulative, and disabling effect. Thus the seeds of a neurosis which may lie dormant in many individuals may be brought to fruition under sufficiently strong emotional stress. It is evident that many people, unaware themselves of the fact, live in the shadow of a nervous breakdown. "A neurosis may happen to anyone. Some are born with neurosis, some achieve neurosis, and some have neurosis thrust upon them. It is the belief of many psychiatrists that everyone has his breaking point, from which he will retreat in a neurosis!"[11] To prevent a person from reaching this *breaking point* is the main job of the teacher.

Definition and Explanation of Terms

Before proceeding any further, we should be clear in our minds of the meaning of three terms: normalcy, neurosis, and psychosis.

Normalcy: The dictionary defines the word *normal* or "normalcy" as a state of conforming to the usual and established standard of behavior. If a person's behavior pattern is similar to the behavior pattern of the great majority of people, he is judged to be normal. However, psychiatrists tell us that there are no exact boundaries in nature, and that it is impossible to delimit differences precisely in human personality. It is well to remember that every normal individual has periods of nervous stresses and tensions, as well as symptoms of nervous illness. It is said that "every normal person is a little neurotic, and every neurotic much normal."

Neurosis: It follows from the foregoing that a "neurotic character" may mean almost everyone. The term applies specifically to anyone who is moody or irritable, or unreasonably aggressive, or excessively timid, suspicious, or easily excitable, and many more characteristics of like nature which manifest themselves in different degrees of intensity in the course of daily living. Neurotics are people who suffer from no very definite symptoms, but whose behavior is to a high degree impulsive, capricious, and conspicuous. The neurosis usually effects only a part of the person. He still can carry on the activities of the world, and be a self-supporting member in a social group. Although he lives in a real world, its difficulties and problems are much greater for him to bear than they are for normal persons. People whose many acts are determined and dominated by some phobias, like black cats crossing their paths, the number 13, fear of enclosed or open spaces, and many more different irrational fears, are infinitely more handicapped in their enjoyment of life than those who are not thus restricted in their activities. How intensely people can suffer from such fears is poignantly related by Professor Ellery Leonard in his book *The Locomotive God*. For years this brilliant educator was tormented by fears which restricted his existence to a small space on the campus of the University of Wisconsin.

[11]Davis, J. E. (Sc.D.), "Mental Hygiene," April, 1945, p. 225.

Psychosis: The term *psychosis* on the other hand, designates a mental state of near or complete disintegration of personality. A psychotic individual lives in a world of phantasy, in a world of his own making, in which he finds happiness, and satisfaction of all of his desires and wants. The world of reality, of strife, of conflict does not affect him any more. He has reached, as it were, the last and highest stage of freedom from want, worry, and fear.

Such persons do not concern us here. As teachers, we do not come in contact with such extreme mental cases. We do, however, encounter in our daily school activities apparently normal boys and girls many of whom nevertheless may be afflicted by upsetting doubts of various kinds, who are torn by imaginary conflicts, and who are tortured by many irrational fears. Such abnormalities not only keep them from the full utilization of their abilities, but they make their lives most unhappy and distressed. To recognize tensions and conflicts of various sorts in our pupils and be able to help them to help themselves is one of our main tasks. Are we equipped emotionally as well as by training to do this job? To be sure, a person who is a trained teacher cannot be expected to be a trained psychiatrist also. What every teacher must possess, however, is the layman's understanding of the *psychiatric* fact that every act of the youngster, whether socially acceptable or not, is a tension releasing mechanism. One of the chief aims of the teacher should be to transmute these natural impulses into socially constructive behavior patterns by means of the activities carried on every day in the school workshops. To direct this regenerating and stabilizing process effectively, he must understand the underlying therapeutic significance of the various activities engaged in by the individual in the shops.

Development of the Idea of Occupational Therapy

Biologists tell us that activity in the wider sense is the normal state of all living beings, and that rest is only an interval of time between activities for the purpose of recuperation so that further activity may be made possible. The organism that is not active is halfway on the road to death. Still more is this the case with the mental part of the organism. In reality there is no rest. Even the apparent rest periods of the organism constitute a different aspect of activity, for recuperation implies ceaseless activities of the different organs within the organism itself. There are thus two distinct kinds of activities: the external, the observable activity engaged in by the total organism, and the internal activity impelled by the various functioning systems of the organism. From this point of view a rest is an illusion, and the term *activity* assumes an all-pervading, universal significance.

Granted this being the case, the question poses itself, activity to what end? Activity for the purpose of survival of the organism. This is the underlying, primordial drive of all living things. Adaptation to the environment is one of the main functions of the nervous system of man and animals. The same may be said of our sensations, for they are not ends in themselves. They would be of little or no value to the organism if they would not inform it when it is proper and necessary to act. Likewise, our emotions, in a large measure, are instruments for action; and in many pressing, dangerous moments, they are the only activating agents of man. In such instances one acts first and thinks after the act. Even a great deal of our memory is predicated on action, for it is of survival value to man to avoid past mistakes and to repeat success. It is by action, therefore, that we test the fitness of our sensations, emotions, and thoughts.

This activity impulse in man may take various forms. One of these, and perhaps the most important one, is work, taken in the widest and best sense of the word. It has been wisely said "that it is as bad to deprive a man of work as it is to deprive him of food." To be sure, work is desirable, but what kind of work is beneficial to man's well-being? There is work that is degrading and devastating. Surely the slaves who built the pyramids of Egypt, the slaves who rowed the galleys of ancient Rome, or the men and women who toiled in the sweat shops, certainly these drudges did not sing paens glorifying toil. Such labor has no positive emotional content. It only generates fear and despair in the hearts of the toilers, and corrodes the foundations of mental stability, emotional and physical fitness.

According to Bernard Shaw, the ideal state of mankind "is a commonwealth in which work is play and play is life." Only that work becomes a boon to mankind which is transfused with emotional interest, moral worth, and intellectual vision. A man engaged in work that is interesting and purposeful is less likely to be absorbed with introspective self-study. A mind turned upon itself to the exclusion of all outside interests is a mind just about lost. Only desirable occupation can and does prevent the mind from taking this dangerous road to self-destruction. The method of prevention by which "this can be accomplished is through releasing the creative-dynamic drives of the child and adult, converting them into socially approved behavior. When the drives of talent and interest are fulfilled, a state of satisfaction and consequent relaxation result."[12] On the other hand, "the results of the thwarting of the work sentiment appear to lie along two lines: depression followed by apathy and then sometimes by psychoneurosis, or restlessness and irritability followed by rebellion."[13]

(To be continued)

[12]Slavson, S. R., *Creative Group Education*, Published by Association Press, p. 14.
[13]Gillespie, R. D. (M.D.), *Psychological Effects of War on Citizen and Soldier*, Norton, N. Y., 1942, p. 87.

What's in a Name?

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Once a subject field has been identified with a particular name, it is next to impossible to entirely change that name. To establish the term *industrial arts* and have it quite generally accepted in educational circles to replace such terms as sloyd, manual training, manual arts, and mechanic arts has taken approximately 25 years. However, laymen still refer to school shop work as manual training. In a few localities teacher groups also hang on to the old names; thus we have manual arts and mechanic arts teachers associations.

Lately, within our own ranks, there has developed a considerable variance in terminology. In some teacher-training circles *industrial education* is being used synonymously with industrial arts while the *A.V.A. Journal* on it's editorial page uses industrial education in place of what was formerly designated as vocational trade and industrial education. Still another interpretation which appears to have merit is that industrial education is a broad term including both industrial arts and trade and industrial education. Many states have industrial education associations which in-

clude both industrial arts and trade and industrial groups. This interpretation seems to be logical, but so long as industrial education and industrial arts are used synonymously in other quarters, the situation is still in a muddle.

This lack of uniformity is confusing to educators in other fields and is especially confusing to the beginning industrial-arts teacher. He applies for an industrial education teaching position in a city school system and is referred to the vocational supervisor or is given an application blank and informed of the date of the next examination for trade and industrial teachers. Then it is discovered that he is prepared and certificated to teach industrial arts. The beginning teacher is not to be blamed since in his teacher training he majored in what was called industrial education. It was designated as such in the college catalog and spoken of as industrial education in the classroom and about the campus.

Recently, suggestions have been made that we adopt the term *general industrial education* in place of industrial arts. "Shades of the Past" — must we add to the confusion in our ranks by launching a campaign in search of a new name for industrial arts. We say "No". What's wrong with industrial arts anyway? Is it not comprehensive enough to cover the broad concepts of the program? Is it not by this time well established and recognized in educational circles? Are there any legitimate reasons for a change? As yet, we have heard very few convincing arguments in favor of a change. Until we are entirely sold on the need for a new name, let's agree upon industrial arts and use it in our talking and our writing.

It might not be out of order to suggest that the American Vocational Association at its next convention form a committee of members from the two sections involved whose function would be to clarify, redefine, and readopt uniform terminologies.

Who Fails in Trade and Industrial Courses?

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In vocational education, the term *failure* does not apply to the learner. Rather, the term should apply to the administration and supervision of the vocational program that permits learners to fail. To place the learner into a situation where success can be achieved is the basic purpose of vocational education. When the vocational program retains the learner in a specific training course for which he has proved lack of interest or aptitude, then the school is the failure. The stigma attached to the term *failure*, as school systems commonly use the word *synonymously* with certain types of pupils, makes the term anathema to vocational education.

When the foundry superintendent examines castings that are *failures*, these castings are not doomed in the sense that they are allowed to accumulate and thereafter be ignored. Close examination of the castings will reveal the cause for the failure, and something is done about further processing to prevent such recurrence. With considerable care, the entire procedure is re-examined. The point to consider is that the cause for the failure is sought. Then definite, effective measures are taken to do something about it. Not the least of these measures is correction of faulty practices on the part of the molder, the patternmaker, the designer, and the metallurgist.

Why are there persons who are eliminated from a vocational course? Eliminations result from factors such as the following: (1) Subject matter is not suited to aptitude. (2) Interest lacks. (3) Effort lacks. (4) Parental interference or neglect.

All of the administrative and supervisory personnel, the buildings and their custodians, the equipment and supplies, the teaching staff, all these exist for a single thing to happen, namely the learner-teacher relationship. If the objective is clear to both teacher and learner, that is if both fully comprehend the purpose in being together, then in large measure the preparation step of the well-known quartet is accomplished.

Proper presentation followed by practical application should produce understandable results when checkup time comes. Vocational education looks upon the test step as the place to investigate the effectiveness of the teacher, rather than the negative thing which says to the learner, "You failed on that point."

Standards of Selection and Tryout

Any school that purports to prepare people by specific training for a specific occupation is extremely concerned with the quality of its product, for the same basic reasons that the foundry superintendent wants quality castings. Although persons are eliminated by the schools of medicine, of dentistry, of pharmacy, of law and the like, such schools are not reproached by the question, "What will we do with them if you don't take them?"

Vocational education for trades and industry has much to do in establishing sound standards of selection and tryout for its students whether they are preparing for entrance into such occupations or attending part-time or trade extension classes.

In view of the foregoing, there is a specific task that awaits effective co-ordination for any vocational education program. The selection and retention of trainees, which is that task, requires agreement on a policy by which maximum attainment of the purposes for which the various programs are organized, is achieved. The task is a continuing one, and is especially acute for a trade preparatory program. The one effective device is the craft advisory committee, which should recommend the policy that should be followed.

When a teacher sees in a pupil his best possibilities and encourages him along these lines rather than discouraging him because of his weaknesses, that teacher has caught the real purpose of teaching. — From *Commonwealth of Pennsylvania*, Dept. of Instruction.

The wide and fascinating variety found in the figure of mahogany wood is due to the fact that the wood of no two mahogany logs is exactly alike.

A Production System For Vocational Shops

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Need for a Production Control System

The need for a production control system in industry has long been recognized. In the days of the nineteenth century the average manufacturing plant was small and was staffed with mechanics and artisans who were masters of every phase of their trade. The owner of the plant was often the superintendent or manager. The workman had an opportunity not only to know every phase of the manufacture of the product, but also to understand its uses. He also had an opportunity to contact the plant owner and settle his difficulties with him directly.

America's mass production system has resulted in the highest standard of living in the world but it has not been developed without some loss. The division of labor which makes this system possible is doing away with the artisan. In his place we find the machine operator with a relatively few highly skilled mechanics and technicians. Gone also is the easy contact between owner and worker. With single manufacturing units employing as many as 80,000 workers, an elaborate system of production control has become necessary in order to follow the progress of work, set and maintain production schedules, and accurately determine and control costs.

The need for such a system in a school shop is not so universally recognized. This is partly due to the way in which the school shop has been developed. Only rarely is the school shop regarded as a production unit. All our attention has been centered on the teaching of so-called processes and operations. It has been the common practice in our schools, despite the trends in industry, to stick to the artisan system. The "project or job" has been used solely because of its value in teaching the process. Often pseudo jobs have been developed which have no other use. Boys have been allowed to choose jobs at random and are then required to follow them through to completion.

This method has been defended on the basis of pupil incentive and pupil interest. Granted that, to a certain type of pupil, the desire to produce a completed job may be a powerful incentive; to another type the necessity of completing a job which may be beyond his ability results only in frustration and discouragement. It has been proved by experience that to such a pupil work done on a mass production basis is satisfying because it is repetitive enough so that he is not continually working beyond his depth. At the same time the natural love of a boy for mechanical activity is satisfied.

The artisan method of work has been adopted by the industrial-arts teachers and rightly so because in industrial-arts classes we do not attempt to develop skills as much as knowledges. We attempt to give the pupil an overview of the manufacturing processes and problems and so must require that each job be carried through to completion.

While this method is highly satisfactory for industrial arts, it has no place in the vocational field. Possibly just as surely the production system is unsuited to industrial arts. In the vocational class we attempt to develop industrial methods and skills. To do this we must duplicate industrial conditions and methods to the utmost possible extent.

Another argument for the adoption of a production system has resulted from the war effort. Equipment, tools, and materials are scarce. With the tremendous investment in school shop equipment, we can no longer afford to overlook the production possibilities. The production of tools and minor equipment items for our shops is probably the first to be considered. Similar tools and equipment may be supplied to other schools and training centers. Countless articles now purchased by the board of education may be produced in our shops with great saving. Articles used by churches and charitable organizations, Red Cross, etc., may be made.

The School as a Production Unit

The school has never been thought of as a production unit. We have been primarily concerned with education with human beings as our product. This concept of the function of a school system should continue. The production of human beings well equipped to cope with their environment should continue to be the major objective of the school. However, in a school or school system where facilities are provided, the production of useful articles may well become a secondary objective. This is particularly true where sufficient planning has been done to insure that the objectives of education and production are not in conflict.

In the larger schools or school systems are all the elements of a complete production system, even the maintenance services. In Elmira, for instance, we have a machine design class to do design work. We have a foundry, three machine shops, a sheet-metal and welding shop, and a print shop to do the production work. In addition we have an electrical shop and a carpentry shop to do the maintenance work. The auto shop, while it is turning out live work, comes under a different category and must be treated separately. Work can be designed in the design class, patterns and molds made in the foundry, castings made in one of the local foundries, and machined in the machine shop. Fabricated metal parts can be made in the sheet metal and welding shop.

To accomplish all this a control and planning system is necessary.

Correlating Production Work and Education

One of the greatest criticisms of production methods in school shops has been the difficulty in scheduling production. Rarely is a completed article so designed that the operations fit perfectly into the teaching sequence. In an industrial organization, one machine, possibly a turret lathe, may perform all the turning operations on a shaft. The work then may go to a milling machine to have a keyway cut; then to a drill press to have a hole drilled, etc. Production scheduling in industry is aimed toward keeping all these machines busy at all times.

In the school shop the turning operations probably will be done separately on the engine lathe. Some of them may be beyond the level of any members of the class. If this is true, those operations within the ability of the class must be done, and the work stored until at least one member has progressed sufficiently to do the next operation. Scheduling then must

be aimed not at keeping all machines in operation but at keeping a sufficient volume of work ahead so that the instructor always has a production job on the appropriate level. This type of planning is more difficult than regular industrial planning. The objective then is not in planning for volume of production but for planning for continuity of teaching sequence.

Perhaps one of the strongest criticisms of this system is that the teacher does not have the time to plan all this production work. This is true. Much of the planning must be done by the supervisor. Certain planning functions, however, must be taken care of by the teacher to insure against disruption of the teacher's plans. The supervisor should receive the orders for the work to be done. The shop teacher should plan the operations, make up operation tickets, and assign work to pupils. In this way he has complete control over his course of study.

Obviously, if this method of teaching is to be successful, some basic changes are necessary in our courses of study. In the past, shop courses have been based upon a logical arrangement of processes and operations obtained from the trade analysis. Related technical information is usually taught in formal classes organized along academic lines. In the early days of shop instruction, jobs were chosen which would fit the course of study and all members of the class worked on the same job at the same time. Jobs ranged from the very elementary for beginners to the complicated for more advanced pupils. Later this plan was altered to permit the choosing among several jobs of approximately the same difficulty.

In addition to those already mentioned, several objectives to the accepted system suggest themselves. No account was taken of individual differences either in shop or related technical classes. Perhaps these differences are more pronounced in shop groups than in academic. Every shop teacher has had in his classes ranges in ability all the way from unskilled to highly skilled. Every teacher has wondered what to do with those of little ability.

This condition does not differ much from that found in industry. Every foreman has under his supervision men who can only do routine work, and others who are capable of highly skilled work. Every industry needs machine operators, toolmakers, and truckmen. In industry the truckman is not given the job of making a fine tool, neither does the toolmaker have to transport production work from machine to machine.

So also in our school shops do we need machine operators and toolmakers. We need mechanics and helpers. Again our organization should parallel industry. How are we going to arrange our courses to accomplish these objectives?

Obviously the logical teaching sequence must be maintained. But we are no longer able to choose or design pseudo jobs which fit the teaching sequence. In production work, the jobs must be of a useful nature, and not designed wholly for teaching purposes. Rarely will a job of this type fit into our courses of study unless it is broken down into operations. Each operation may then be fitted into its proper place in the course of study.

In order to facilitate fitting the operations into their proper position in the course of study, the course should be divided into levels, each level having its appropriate processes and operations. This organization should also permit more efficient handling of individual differences. Each level should have an objective. For instance, the objective of level I for the machine shop might be "To teach the fundamental operations of the basic machine tools, lathe, milling machine, shaper, and drill press." The objective of level II might be "To train routine operators for the basic machine tools." Each level will have for its objective a higher level of skill than that preceding. Levels will vary in the time element depending on the degree of skill to be attained.

This organization effectively solves the problem of individual differences by permitting a boy to proceed at his own rate. If the boy only completes two or three levels, he is obviously capable of only routine machine operation, while if he completes eight to ten levels he is a potential toolmaker. Other trades have similar subdivisions and lend themselves just as easily to this type of organization. Related technical work can be arranged to correlate with the shopwork. Both shop and related work must be taught on an individual basis. Following are outlines for first and second levels for courses in machine shop, sheet metal and welding, foundry and electricity. The technical course in machine design, while an important link in the production system, is a special case and must be treated separately. The class in vocational carpentry will be doing some maintenance and production work, and it also is divided into levels, so that the regular production system will be used as in the other shops. The print shop is organized in the same way.

Special Fund Approach to a Training Problem

EDWARD M. FEE
Special Assistant to Principal
Edward Bok Vocational-Technical School
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Acute labor shortage in hand sewing for the men's garment industry in the Philadelphia area has resulted in a training program at the Bok Vocational Technical School, which has the approbation of both organized labor and the clothing manufacturers. The program embodies features which may point the way to the solution of several of the knotty problems that have perplexed administrators of vocational education, particularly the securing of useful work from manufacturers for training purposes, the recruiting of trainees, union recognition, and trainee payment during the learning period.

The Bok Program was developed under the direction of William Brunton, principal of the Bok Vocational-Technical School, and Miss Catherine Grant, co-ordinator of the clothing and garment trades. Under this plan developed after a series of conferences, the Philadelphia Men's Clothing Manufacturers' Association have set up a $25,000 postwar fund subscribed by its members. From this fund trainees are paid 50 cents per hour for the period they are in training at the school.

Classes in hand sewing are in session 25 hours per week, on a five hours per day basis. This phase of the training takes from one to six weeks, depending upon the ability of the trainee. Training begins with the basic fundamentals such as the use of thimble, handling a needle, and making straight small stitches on scrap cloth. From these exercises the trainee progresses to models of buttonholes, sleeves, armholes, and sides of coats. When the trainees feel sure of themselves they work on garments

in the operation for which they are best fitted. From this point on the emphasis is on speed.

At the conclusion of the school training period, trainees work at 60 cents per hour in the factory of a garment manufacturer as a buttonhole maker, or in sewing the felling in men's coats. When the trainee has acquired sufficient skill she is placed on the piecework rate for the job. This may take from two weeks to two months. A recent survey indicated that 14 per cent of the trainees dveloped skill to this point in from two to three weeks after leaving school. At the end of six months the trainees earn $30 to $50 per week. Full union recognition is given by the Amalgamated Clothing Workers.

Teachers are master craftsmen. Furloughs from their jobs are arranged for them by the Manufacturers' Association. The board of public education pay the teachers the minimum hourly rate of a substitute teacher. This is supplemented by the Manufacturers' Association from its postwar fund, so that the teachers will not suffer financial loss by accepting less than they would normally make in industry. In addition, the Manufacturers' Association pays the social security differential, therefore the instructors suffer no financial loss.

The manufacturer supplies all materials for the basic training, and the coats upon which the training is given. Individual manufacturers are required to furnish transportation of all coats from the factory to and from the school. The rate for the work completed is paid by the manufacturer into the postwar fund. This money is used to pay trainees and teachers, and to support the program. In this manner trainees are trained on a useful productive basis. The manufacturer does not profit financially from the work of trainees, but he does receive a much-needed, carefully selected, and well-trained employee. The trainee receives union recognition, a job, and a place in the ranks of skilled labor.

The course began in April, 1946. By December, 335 people had been trained. Thirty trainees are assigned to a class with two teachers. New trainees are accepted as vacancies occur. As trainees acquire the necessary basic skill they are sent to a factory and new trainees are admitted.

In order to secure candidates for the course the Manufacturers' Association advertised in the local press, particularly the foreign language press. Candidates for admission were interviewed privately at the school in the office by Miss Grant, the co-ordinator of the program.

Representatives of both manufacturers and labor have inspected the training facilities and observed the methods of training. They have expressed great satisfaction.

Hand sewing class, men's clothing industry, Bok Vocational-Technical School, Philadelphia, Pa.

Road Map For Instructors

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Dunwoody Industrial Institute
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The road map shows the auto driver his starting point, the best roads, and his destination. He may detour, get lost, have a flat tire, and drive fast or slow. But he always *knows where he is going, where he is,* and *where he has been.*

Not all instructors can say the same.

Is there a *road map* for the instructor? Yes there is and here it is; take your own path:

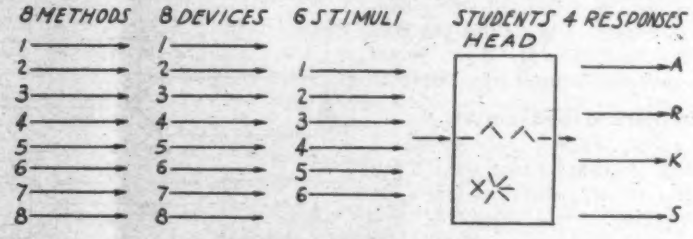
8 Methods: (1) the method of book study, (2) the method of discussion, (3) the lecture method, (4) the practice or drill method, (5) the demonstration method, (6) the laboratory or experimental method, (7) the project method, (8) the method of dramatic expression.

8 Devices: (1) spoken word, (2) written word, (3) charts, (4) panels, (5) slides (films), (6) models, (7) sectional equipment, (8) real equipment.

4 Laws of learning: (1) readiness, (2) exercise, (3) results, (4) association.

4 Factors in Learning: (1) intensity, (2) frequency, (3) relevancy, (4) recency.

4 R's of Memory: (1) register, (2) retention, (3) recall, (4) recognition.



The road map

6 Stimuli: (1) hearing, (2) seeing, (3) feeling, (4) smelling, (5) tasting, (6) self-motivation.

4 Responses: (1) skill, (2) knowledge, (3) reasoning, (4) attitude.

Student Head: Contains nerves or neurons with "gaps" called synapses. X represents a pattern to show associated ideas which effect the responses.

The instructor should pick his destina-

tion (or objective) at right: *skill, knowledge, reasoning, attitude.* (No objection to several destinations!)

Then he should go back to his starting point at left, and select his *method.*

Next, select the vehicle (or device): *oral word, written word,* etc.

Then select the *gasoline* (stimuli — no liquor on the trip!): *hearing, seeing, feeling,* etc.

Now the stop sign is met (the square road block). Wait for the sign to say *go.* The traffic sign can be sped up by the use of *four laws of learning: readiness, exercise, result, association.* The "road block" can be kept open by the use of the *four factors: intensity, frequency, recency, relevancy.* These factors prevent *detours.*

The mechanism of the *stop sign* depends on the *four R's of memory: register* (or pattern), *retention, recall, recognition.*

The instructor's destination may be one or all of the goals — *skill, knowledge, reasoning,* and *attitude.*

Testing and Tests

PERFORMANCE TEST — BASIC ELECTRICITY

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1. *Tools and Materials to Be Issued to Each Student:* Six pieces of No. 14 wire, insulated and cut to *exactly* eight inches in length; one pair of pliers, with cutting edges; one knife; cloth or rag.

2. *Directions to the Student:* This test is designed to measure how well you can make each of the following: (1) Western Union splice, (2) rattail splice, and (3) tap splice. You will be given all necessary tools and materials. A completed model of each type of splice will be passed around the class for you to examine if you care to. Questions about the models will be answered before the test. You will then be given a list of steps which you are to follow *carefully and in order given* when you make the splices. Do not waste time, but remember not to work so fast that you become careless. *This not a speed test; it is* a test on *accuracy* and *workmanship.*

After you have started the test, you may ask any question of the instructor about the splices that is absolutely necessary. However, do not waste your time and his by asking any question which is *not* absolutely necessary.

When the tools and materials have been passed out to you, check to see that you have all the articles listed under (1) above. *Do not begin work until the instructor gives the signal.*

Directions to the Examiner

1. Issue to the student the following: 1 knife; 1 cloth for cleaning bare wire; 1 pair cutting edge (ordinary) pliers; *six* pieces No. 14 insulated wire, cut to *exactly* 8 in. in length.

2. Have model of each of the three types of splices on hand. Pass around the class for its observation *before* the test. Answer all questions about the models as they are circulating.

3. Answer any questions raised by students during the test if they are pertinent; however, *do not demonstrate any of the steps.* Give help to the student if he cannot see through any of the diagrams.

4. Read the directions to the student aloud before the test begins, and answer any questions raised.

5. During the test, circulate among the class to determine that they are following the procedure in correct order.

6. Check each splice carefully per the score sheet; grade.

7. Make sure that the pieces of wire are exactly 8 in. long, as one of the steps in scoring is to subtract the insulation remaining on the wire from *eight inches* to determine the length of bare wire. Remind student to check tools and materials.

NOTE: The diagrams accompanying the performance steps are roughly sketched. While the attempt was made to present as accurate and clear visual aid to the student as possible, they are by no means a finished product. Much more accuracy and neatness should prevail in drawings of any performance test actually given to a class.

Steps in Making the Tap Splice

(*Perform in the order given*)

1. Select two pieces of wire. Pare insulation from end of one piece with knife held at a 45-deg. angle. Leave exactly 2 in. of bare wire. From second piece remove insulation from *center,* leaving exactly 2 in. of bare wire. See Figure 1.

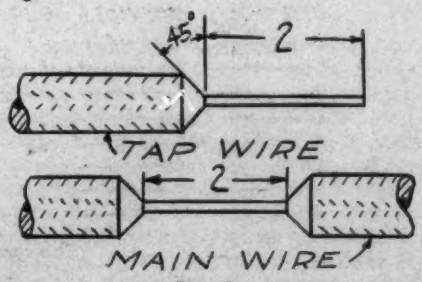

Fig. 1.

2. Clean bare surfaces with back of knife blade. Wipe *thoroughly* with cloth.

3. Cross bare surfaces at right angles at a point about ¼ in. from the insulation of the tap wire, and ¼ in. from the right-hand insulation of the main wire. See Figure 2.

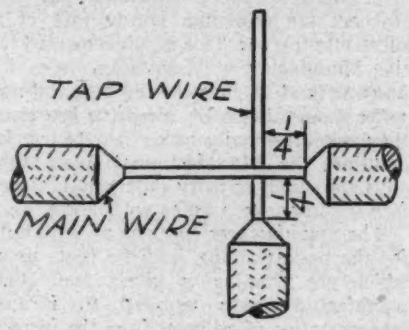

Fig. 2.

4. Bend the end of the tap wire into a hook over the center of the bared piece of main wire. See Figure 3.

Fig. 3.

5. Make *six and only six* tight, short turns of the tap wire around the main wire. Make turns tight enough so that the main wire does not turn in the coils of the tap wire. *Do not leave any space between the coils.* Cut off the surplus wire with the pliers. Press the ends down firmly, flush with the surface of coils. See Figure 4.

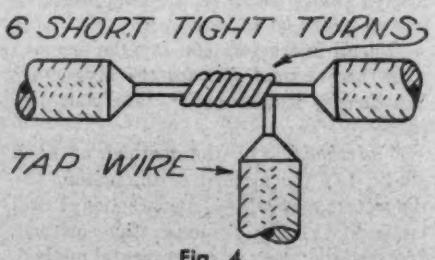

Fig. 4.

6. Lay the tap splice aside and go on to the Western Union splice.

Steps in Making the Western Union Splice

(Perform in the order given)

1. Select two pieces of wire. With knife, pare off enough insulation from one end of one wire so that you have *exactly three inches* of bare wire exposed. Make cut in insulation at a 45-deg. angle. Repeat the process on the second wire. See Figure 5.

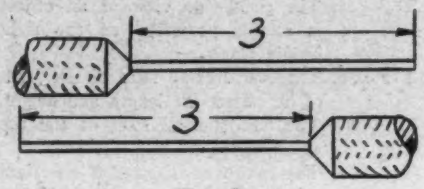

Fig. 5.

2. Clean the bare wire ends thoroughly with back of knife blade; wipe with cloth.

3. Cross the bare ends at right angles at a point about one inch from the insulation. Bend wires at right angles so that the two form a cross. See Figure 6.

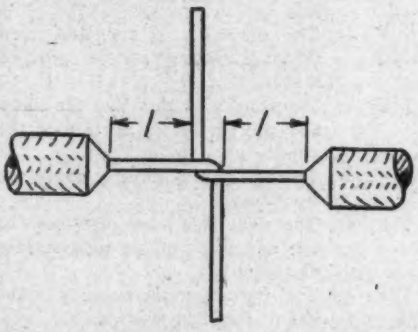

Fig. 6.

4. Make *four* tight, short turns of each end around the other wire, winding toward insulation. *Do not leave any space between the turns.* Cut off surplus wire with pliers. Press remaining ends down firmly, flush with surface of turns. See Figures 7 and 8. Line up main wires as shown in Figure 8.

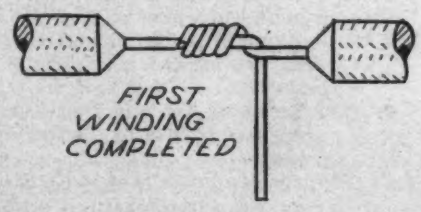

Fig. 7.

Fig. 8.

5. Be sure that the turns are tight enough so that the straight wires do not move or turn easily in them.

6. Lay splice aside and go on to the rattail splice.

Steps in Making a Rattail Splice

(Perform in the order given)

1. Remove insulation from one end of each of the remaining pieces of wire so that you have *exactly* 2 in. of bare wire on each end. See Figure 9. Wipe with cloth, after scraping with back of knife blade.

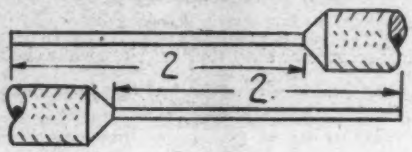

Fig. 9.

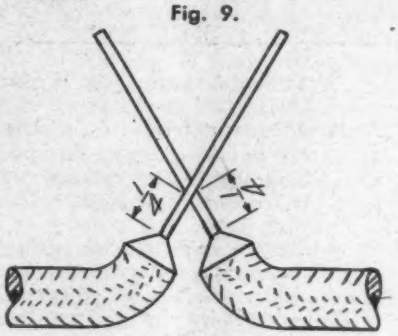

Fig. 10.

2. Cross wires at the angle indicated in Figure 10, at a point about ¼ in. from the insulation.

3. Twist the wires together *exactly six* times, as shown in Figure 11. Hold tips with pliers while twisting.

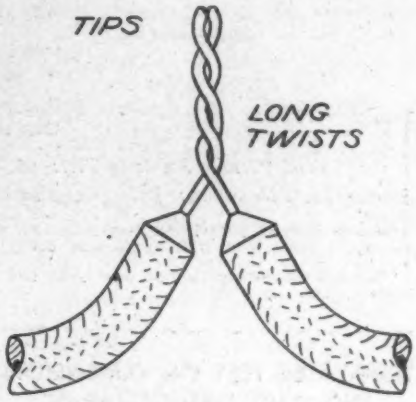

Fig. 11.

4. Press ends firmly together at tips; make sure *all* the *long* twists are tight, with no space between the two wires.

5. Check all three splices carefully. When you have done this, and are sure that you have done everything indicated in the directions, hand all three to the instructor.

METHOD OF SCORING PERFORMANCE TEST

(Self-Explanatory Score Sheet)

For Tap Splice:

	Possible score:	Student's score:	
1.	5		*1. Tolerance of 1/16 inch on bared wires, after which 1 point deducted for each 1/32 inch variance. (Maximum deduction: 5)
2.	5		2. Five points deducted if coils turn on main wire. (Tested by hand)
3.	2		3. Two points deducted for unclean wires (bare). (Tested with clean white cloth)
4.	5		4. One point deducted if razor blade can be inserted between two coils
5.	1		5. One point deducted if end of tap wire is not flush with coils. (Tested with rule)
6.	6		6. One point deducted for each turn more or less than six.
Total:	24		

For Western Union Splice:

	Possible score:	Student's score:	
1.	5		*1. Tolerance of 1/16 inch on bared wires, after which 1 point is deducted for each 1/32 variance. (Maximum deduction: 5)
2.	5		2. Five points deducted if either or both straight wires turn inside coils. (Test by hand)
3.	2		3. Two points deducted for unclean wires (bare). (Tested with clean white cloth)
4.	3		4. One point deducted if razor blade can be inserted between two coils.
5.	2		5. One point deducted for each end not flush with coils. (Tested with rule.)
6.	8		6. One point deducted for each turn more or less than 4 on each set of coils.
Total:	25		

	Possible score:	*Student's score:*	*For Rattail Splice:*
1.	5		**1. Tolerance of 1/16 inch on bared wires, after which 1 point is deducted for each 1/32 inch variance. (Maximum deduction: 5)
2.	2		2. Two points deducted for unclean bare wires. (Tested with clean white cloth)
3.	6		3. One point deducted for each place gapping enough to let light through. (Maximum deduction: 6)
4.	6		4. One point deducted for each long twist more or less than six.
Total:	19		

Total Possible Points in Test: 68.

Scoring Tools Necessary: Rule, measuring in thirty-seconds or sixty-fourths; clean white cloth.

*Measure insulated part of wire from point bare wire begins to end of wire; subtract from *eight inches*. Limits: For tap: 1 15/16 to 2 1/16. For Western Union: 2 15/16 to 3 1/16.

**Measure insulated part of wire from point bare wire begins to end of wire; subtract from *eight inches*. Limits: 1 15/16 to 2 1/16.

TRUE-FALSE TEST ON DIMENSIONING AND ORTHOGRAPHIC PROJECTION

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Directions: Some of the following statements are true, some of them are false. If you think the statement is true, encircle the letter *T* before the statement. If you think the statement is false, encircle the letter *F* before the statement. Do not guess.

Example:

(T) F. The ohm is the unit of resistance.

T F 1. A line that has been bisected is divided into two equal parts.

T F 2. To bisect an arc is to divide it into two equal parts.

T F 3. An angle that is trisected is divided into two equal parts.

T F 4. A line is perpendicular only when it is in a vertical position.

T F 5. An inscribed hexagon is a five-sided figure drawn within a circle.

T F 6. A circumscribed octagon is an eight-sided figure drawn about a circle.

T F 7. An angle is a geometric figure consisting of angular lines.

T F 8. The size of an angle is the amount of spread between the two lines which form the angle.

T F 9. An ellipse is a circular figure bounded by a regular curve.

T F 10. An ellipse has two axes at right angles to each other.

T F 11. The longer axis of an ellipse is the major axis.

T F 12. The shorter axis of an ellipse is the minor axis.

T F 13. A rectangle is a parallelogram having four equal sides and four equal angles.

T F 14. A pentagon is a plane figure having six equal sides and six equal angles.

T F 15. A circle is a plane figure bounded by a single curved line, called the circumference, which is equally distant at all points from a point within, called the center.

T F 16. Orthographic projection is a method used to draw a detailed description of an object in two or more views on planes at right angles to each other.

T F 17. Every technical man or mechanic need not have a thorough knowledge of the principles of orthographic projection in order to correctly read or make a mechanical drawing.

T F 18. The picture planes in orthographic projection are known as the planes of isometric projection.

T F 19. Lines which are perpendicular to a projection plane and parallel to each other are called projectors.

T F 20. When parallel projectors are drawn perpendicular to a plane of projection the result is an orthographic projection.

T F 21. There are three principal planes of projection.

T F 22. The three principal planes of projection are the vertical plane, horizontal plane, and the profile plane.

T F 23. The three principal planes of projection are at any angle to each other.

T F 24. The most important plane of projection is the horizontal plane.

T F 25. The first angle of projection is universally used by draftsmen for making drawings in this country.

T F 26. Using the third angle of projection it is obvious that the top view is directly above the front view and the right side view is directly to the right of the front view.

T F 27. A rectangular object can have as many as six ordinary views according to the standard arrangement of views.

T F 28. A draftsman selects any face of an object for the front view.

T F 29. The three views most frequently used to accurately describe an object are the front view, bottom view, and left side view.

T F 30. A draftsman selects views having the greatest number of invisible lines.

T F 31. A draftsman prefers the right side view to the left side view.

T F 32. The bottom view is preferred to the top view.

T F 33. The front view of an object is always projected on the vertical plane.

T F 34. The top view of an object is always projected on the vertical plane.

T F 35. The right side view of an object is always projected on the right profile plane.

T F 36. The two over-all sizes of the front of an object are length and height.

T F 37. The two over-all sizes of the top of an object are length and width.

T F 38. The two over-all sizes of the right side of an object are width and height.

T F 39. The over-all length of an object is identical in both front and right side.

T F 40. The over-all width of an object is identical in both top and right side.

T F 41. The over-all height of an object is identical in both front and right side.

T F 42. The top view is the first view drawn. The others are then grouped around.

T F 43. The front view describes the shape and size of the top surface of the object.

T F 44. The top view is directly above the front view.

T F 45. The right side view describes the size and shape of the right surface of the object.

T F 46. The front view is directly to the left of the right side view.

T F 47. A line is seen as a point when it is perpendicular to a plane of projection.

T F 48. A line is seen in its true length when it is perpendicular to a plane of projection.

T F 49. A line is seen in its true length when it is inclined to a plane of projection.

T F 50. A surface is seen as a line when it is parallel to a plane of projection.

T F 51. A surface is seen in its true shape when it is parallel to a plane of projection.

T F 52. A surface is seen in its true shape when it is inclined to a plane of projection.

T F 53. A circular surface is seen as a line when it is perpendicular to a plane of projection.

T F 54. A circular surface is seen as a circle when it is parallel to a plane of projection.

T F 55. A circular surface is seen as an ellipse when it is perpendicular to a plane of projection.

T F 56. A mechanical drawing which accurately and completely describes an

object in every detail is a perspective drawing.

T F 57. A detail working drawing consists of the necessary views, dimensions, and notes.

T F 58. The views describe the shape of the object.

T F 59. The dimensions describe the size of the object.

T F 60. The notes, which must be brief, clear, accurate, and complete, supply certain information about the object that cannot be given in any other manner.

T F 61. Hidden lines are used to describe visible edges and surfaces of the object.

T F 62. Invisible object lines are composed of long and short dashes alternately spaced.

T F 63. Hidden lines are made the same thickness as visible object lines.

T F 64. The first dash of a hidden line always touches the full line at which it starts.

T F 65. When a hidden line continues as a full line no space is left between the first dash of the hidden line and the full line.

T F 66. The dashes of hidden lines never meet at corners.

T F 67. The dashes for invisible arcs start and stop at the tangent points.

T F 68. Drawings are dimensioned for the purpose of describing the size of the object and for the convenience of the mechanic as a guard against errors during the process of production.

T F 69. A working drawing does not have to be fully dimensioned because the workman scales the drawing.

T F 70. A dimension line is a medium dotted line drawn parallel to the distance to be measured.

T F 71. The dimensions for machine drawings are placed above the dimension line.

T F 72. At the ends of the dimension line carefully made arrowheads are affixed.

T F 73. The length of the arrowhead is approximately three times its spread.

T F 74. A leader is a fine, full, straight line terminated at one end by an arrowhead.

T F 75. A leader is used to direct attention to a point, line, or surface to which the note or dimension refers.

T F 76. A leader is always drawn freehand.

T F 77. A center line may be used as a dimension line.

T F 78. A surface of an object to be machined or finished is so indicated by 60-deg. V.

T F 79. A code figure or letter is inserted in the opening of the V to indicate the class of finish required on the surface of the object.

T F 80. The diameter and depth for a counterbored hole is always given in a note on the drawing.

T F 81. *f* all over is the correct note to be given on a drawing when the casting is to be machined all over.

T F 82. All dimensions greater than 72 in. are expressed in feet and inches.

T F 83. All dimensions less than 72 in. are expressed in feet and inches.

T F 84. When all dimensions are expressed in inches, the inch symbol following the figure is omitted.

T F 85. Extension lines are fine, full lines which start right from the object lines.

T F 86. Extension lines may extend any distance beyond the dimension lines.

T F 87. The radius of a circle should always be given.

T F 88. The abbreviation D follows the dimension indicating a diameter of a circle unless it is apparent that the dimension indicates a diameter.

T F 89. The abbreviation R follows the dimension indicating a radius.

T F 90. It is always well to repeat dimensions as an aid to clarity.

T F 91. Dimension figures may be made to any height on a drawing.

T F 92. Horizontal dimensions should read from left to right.

T F 93. Vertical dimensions should read from bottom to top.

T F 94. Inclined dimensions should read from bottom to top.

T F 95. The bar separating the fraction is always inclined.

T F 96. In a three-view drawing it is proper to place dimensions anywhere on the sheet.

T F 97. In a two-view drawing the dimensions are placed only to the left of the object.

T F 98. Parallel dimensions are to be at least ¼ in. from the object and ¼ in. from each other.

T F 99. Dimensions placed on parallel dimension lines should be staggered to avoid confusion.

T F 100. An angle is dimensioned by placing the dimension horizontally on an arc used as a dimension line.

1. T	21. T	41. T	61. F	81. F
2. T	22. T	42. F	62. F	82. T
3. F	23. F	43. F	63. F	83. F
4. F	24. F	44. T	64. T	84. T
5. F	25. F	45. T	65. F	85. F
6. T	26. T	46. T	66. F	86. F
7. F	27. T	47. T	67. T	87. F
8. T	28. F	48. F	68. T	88. T
9. F	29. F	49. F	69. F	89. T
10. T	30. F	50. F	70. F	90. F
11. T	31. T	51. T	71. F	91. F
12. T	32. F	52. F	72. T	92. T
13. F	33. T	53. T	73. T	93. T
14. F	34. F	54. T	74. T	94. F
15. T	35. T	55. F	75. T	95. F
16. T	36. T	56. F	76. F	96. F
17. F	37. T	57. T	77. F	97. F
18. F	38. T	58. T	78. T	98. T
19. T	39. F	59. T	79. T	99. T
20. T	40. T	60. T	80. T	100. T

TEST — MECHANICAL DRAWING I

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General directions: This test will take approximately forty minutes. Read the directions for each part carefully. It will not be necessary to ask questions.

Part I — True-False Test

Directions for items 1–50: Some of the following statements are true and some are false. If you think the statement is true, draw a circle around the capital letter T at the left: if you think the statement is false, circle the letter F. Your score will be the number right.

Example: (T) F The appearance of a drawing may be ruined by poor lettering.

T F 1. You can improve your lettering by copying from good models and careful practice.

T F 2. All dimensioned figures on the drawing should be read from the lower right corner of the paper.

T F 3. Observe the order and direction of strokes when you are learning to letter.

T F 4. Crowded letters and words are more easily read.

T F 5. Costly errors in the shop may be caused by poor lettering.

T F 6. It is universally accepted practice to use only capital letters on working drawings.

T F 7. Only vertical lettering is acceptable in industry.

T F 8. Uniform height in lettering is secured by light-penciled guide lines for the tops and bottoms of the letters.

T F 9. Strokes in lettering must be bold and decisive to give uniformity in weight of line.

T F 10. All inclined or vertical strokes should be made from the top downward: all horizontal from left to right.

T F 11. Lettering is most satisfactorily done with a well-sharpened 2H pencil; or with a well-selected, pliable pen of good grade.

T F 12. The space between two words should appear uniform and should be a little more than the height of the letters.

T F 13. Like characters, such as all H's, should be uniform wherever they appear on the drawing.

T F 14. Good drawing boards are usually made of hardwood, such as maple, birch, and oak.

T F 15. The ends of the drawing board should be kept perfectly straight and true.

T F 16. The drawing paper is placed in the upper-right hand section of the drawing board.

T F 17. The record strip is completed only after the drawing is finished.
T F 18. A 6H pencil is soft.
T F 19. The pencil should be sharpened on either end.
T F 20. The T square is composed of the head and the tongue.
T F 21. Only the upper edge of the T square is used.
T F 22. The 45-degree and the 30–60 degree triangles are the two triangles in ordinary use.
T F 23. With an architect's triangular scale, it is easily possible to make drawings to scale an eight, quarter, half, full, twice, or four times actual size.
T F 24. There are definite steps in penciling a working drawing.
T F 25. To locate the center of the sheet of drawing paper, draw diagonals across the paper from one corner to the opposite corner.
T F 26. The record strip appears at the top of the sheet.
T F 27. Working drawings are used by the home builder, homeowner, engineer, lawyer, doctor, and skilled mechanic.
T F 28. Border lines are very light lines.
T F 29. Hidden edge lines are lines about ⅛-inch long, somewhat lighter than visible lines, separated by ⅛-inch spaces.
T F 30. Dimension lines are drawn ¼ inch from the outline of the view and if there are more dimensions than one, space them ¼ inch apart.
T F 31. Extension lines are drawn parallel to the dimension line.
T F 32. Center lines are fine, light, broken lines.
T F 33. Dimensions are usually placed to the right, below and between the views of the drawing.
T F 34. Arrowheads are made narrow; about half as wide as they are long, and should be sharply pointed.
T F 35. The inch marks are omitted when all dimensions on the drawing are given in inches.
T F 36. The division line in a fraction need not be in line with the dimension line.
T F 37. Knurling is an operation to produce a surface offering a better grip on the job.
T F 38. You should be able to letter a drawing neatly and quickly.
T F 39. Case hardening means to harden the outer portion of the metal leaving the core soft.
T F 40. "f" indicates surfaces that are to be machined.
T F 41. If only one pencil is used for drafting, the most practical one to select would be a 4H pencil.
T F 42. Every working drawing must show all the dimensions necessary for the doing of the job.
T F 43. The tool and diemaker is the occupation making the most use of the knowledge of mechanical drawing.
T F 44. A center line should consist of alternating long and short dashes.
T F 45. Cross section lines are usually drawn at 45 degrees.
T F 46. A circle is dimensioned by its diameter.
T F 47. A plan view of a tapped hole is usually indicated by a full circle inside a dashed one.
T F 48. The threads in a small threaded hole are made by using a die.
T F 49. The threads on a small bolt are usually made by using a tap.
T F 50. The drawing of dimension and extension lines is most satisfactorily done with a well-sharpened 3H pencil.

Perfect Score — 50

Part II — Matching

Directions for items 51–60: In the two columns below are listed common mechanical drawing terms. Place in the parenthesis in front of the phrase in column 1 the identifying letter of the work or phrase in column 2 which is most closely related in meaning. Use each letter but once. Your score will be the number right.

Example: (N) A very soft pencil. *Example:* N. 5B pencil

Column 1	*Column 2*
( ) 51. A very hard drawing pencil.	
( ) 52. Composed of the head and blade fitted firmly together.	A. architect's scale
( ) 53. Used in drawing rooms to produce drawings which are smaller than the work which it represents, but which are in definite proportion.	B. arrowheads
( ) 54. A graduated measuring instrument made of wood, metal, or paper.	C. border line
( ) 55. Used by patternmakers when making patterns.	D. center lines
( ) 56. Used for measuring in a workshop, an industrial plant, in building construction, or erecting in the field.	E. dimension line
( ) 57. Fine, light, broken lines, consisting of uniform dashes 5/8 inch or more in length, separated by single, uniform short dashes and short spaces.	F. drawing board
( ) 58. Heavy, full lines 1/32 inch wide.	G. extension line
( ) 59. Edges of objects shall be represented by short ⅛-inch dashes, somewhat lighter than visible lines, separated by spaces equal to the width of the lines.	H. hidden edge
( ) 60. Fine, light lines drawn at right angles to the dimension line from a point 1/32 inch from the outline and extended ⅛ to 3/32 inch beyond the dimension line.	J. rule
	K. shrink rule
	L. 6H pencil
	M. T square
	N. visible edge
	O. working drawing

Perfect Score — 10

Part III — Multiple-Choice

Directions for items 61–85: Each of the following items has four alternative answers, only one of which is correct. Underline the correct answer and write its number in the parenthesis at the left. Your score will be the number of right answers.

Example: (1) The appearance of a drawing may be ruined by. (1) *poor*, (2) good, (3) fair, (4) excellent lettering.

( ) 61. Good drawing boards are made of (1) basswood, (2) oak, (3) birch, (4) walnut.
( ) 62. A 6H mechanical drawing pencil is a (1) soft, (2) medium, (3) very hard, (4) hard.
( ) 63. The pencil should be sharpened so that the lead will protrude (1) ⅛ inch, (2) 1/16 inch, (3) ½ inch, (4) ⅜ inch.
( ) 64. In penciling a working drawing, the pencil should be held lightly between the fingers about (1) three inches, (2) one inch, (3) two inches, (4) four inches from the end to insure a light line.
( ) 65. The T square is made up of the head and the (1) handle, (2) blade, (3) frame, (4) tongue.
( ) 66. Each of the draftsman's triangles has an angle of (1) 30 degrees, (2) 60 degrees, (3) 45 degrees, (4) 90 degrees.
( ) 67. The mechanical draftsman uses a (1) rule, (2) architect's scale, (3) shrink rule, (4) machinist's rule.
( ) 68. Angles are measured in (1) inches, (2) feet, (3) degrees, (4) meters.
( ) 69. Arrowheads should (1) touch extension line, (2) extend almost to the extension line, (3) extend past the extension line, (4) touch the dimension.
( ) 70. The extension line projects past the arrowhead (1) 3/16 inch, (2) ⅛ inch, (3) 1/16 inch, (4) 1/32 inch.
( ) 71. The space between the extension line and the object line is (1) ⅛ inch, (2) 1/16 inch, (3) 1/32 inch, (4) 1/64 inch.
( ) 72. Lettering is best done with a (1) H, (2) 3H, (3) 2H, (4) 4H pencil.
( ) 73. Pencils used in mechanical drawing are graded according to the degree of hardness from (1) H to 8H, (2) 2H to 4H, (3) 3H to 4H, (4) 6B to 9H.
( ) 74. A 5H pencil is (1) medium, (2) hard, (3) very hard, (4) soft.
( ) 75. There are (1) one, (2) two, (3) four, (4) three triangles in ordinary use.
( ) 76. The drawing paper is placed in the (1) upper right, (2) upper

left, (3) lower right, (4) lower left section of the drawing board.

( ) 77. Mechanical drawing is a study of (1) pictures, (2) the universal language of the technical man, (3) a required high school course, (4) a system of copying drawings.

( ) 78. Record strips with neat lettering, are required because, (1) lettering is the most important detail of a drawing, (2) it gives the drawing a finished appearance, (3) it makes it easier to understand the drawing, (4) it gives complete identification of the drawing.

( ) 79. At intervals during the making of the drawing the pencil point should be drawn across the pad or file to keep it well sharpened because sharp points (1) move easily across the paper, (2) permits more accurate work, (3) makes the pencil lines more visible, (4) allows the draftsman to work close to the V formed by the T square and the paper.

( ) 80. Dimensions and dimensional notes (1) give the size of the object, (2) they enable the draftsman to check his drawing, (3) they improve the appearance of the drawing, (4) they enable him to redraw the object, if necessary.

( ) 81. Keep the guide lines for lettering (1) very light, (2) light, (3) medium, (4) heavy.

( ) 82. All notes on drawings shall be capital letters, (1) 1/32 inch, (2) 3/16 inch, (3) ⅛ inch, (4) ¼ inch high.

( ) 83. The most practical pencil to select for mechanical drawing would be (1) H, (2) HB, (3) 2H, (4) 6H.

( ) 84. Every working drawing must have (1) heavy lines, (2) three views, (3) neat figures, (4) dimensions.

( ) 85. Threads in a nut are made by (1) die, (2) reamer, (3) tap, (4) broach.

Perfect Score — 25

Part IV — Completion

Directions for items 86–110: Place the correct word in the blank space to make the sentence complete and correct. The figure in the parentheses indicates the number of letters in the answer. Your score will be the number of correct words.

Example: The appearance of a drawing may be ruined by poor *lettering.* (9)

86. Mechanical drawing is ordinarily understood to mean drawing with the aid of ..... (10) in contrast with freehand drawing.
87. Dimension holes on working drawings from center of one hole to the center of the next hole and tie them up to a ..... (8) surface.
88. Either inclined or ..... (8) lettering is acceptable in industry.
89. Good drawing boards are usually made of some ..... (8).
90. To fasten the drawing paper to the board, place the sheet of paper in the upper ..... (4) hand section of the drawing board.
91. Pencils used for mechanical drawing are graded according to the degree of ..... (8) of the lead.
92. The drawing pencil should be sharpened on the opposite end from the ..... (5) mark.
93. The pencil should be held lightly between the fingers about ..... (3) inches from the end to insure a light line.
94. A draftsman should know how to make the things that he ..... (5).
95. Lines at 15 and 75 degrees may be drawn by combining the two ..... (9).
96. The architect's scale is used only to lay off ..... (8) on the drawing.
97. The divider consists of two pointed legs so jointed that the points are ..... (10) to any desired distance apart.
98. Use a pencil eraser of good grade and an erasing ..... (6) when erasing.
99. The first step in penciling a simple working drawing is to ..... (6) the border line and the title block.
100. Drawing diagonals across the sheet from corner to corner will locate the ..... (6) of the sheet.
101. Border lines shall be very ..... (5) full lines, 1/32 inch wide.
102. Visible edges of objects are the most prominent part of a drawing and shall be ..... (6), full lines of medium width.
103. Dimension lines shall be fine, light, solid lines, drawn ..... (8) to the direction of measurement and ¼ inch from the outline of the view.
104. Center lines are located ..... (5).
105. Drawings are dimensioned the exact size that the piece is to be made regardless of the ..... (5) of the drawing.
106. A working drawing consists of three principal parts: views, ... (10), and specifications.
107. Dimensions are placed around the views to show the ..... (4) of the object.
108. The three principal dimensions: thickness, width, and ..... (6) are shown in a working drawing.
109. The size of round holes is usually given as a note with a line pointing to the ..... (6).
110. Giving the size of the various parts of the object in the working drawing is called ..... (12).

Perfect Score — 25

Go back over your work.

KEY

Drafting Test

(Answer sheet — Course 1)

Name .....

Grade..... Hour... Case No....

Corrected by .....

Scoring Record		
Part description	*Perfect score*	*Student's score*
1. True-False	50	.....
2. Matching	10	.....
3. Multiple-Choice	25	.....
4. Completion	25	.....
Total Score	110	

Part I

1. T	10. T	19. F	28. F	37. T	46. T
2. T	11. T	20. F	29. T	38. T	47. T
3. T	12. T	21. T	30. T	39. T	48. F
4. F	13. T	22. T	31. F	40. T	49. F
5. T	14. F	23. T	32. T	41. F	50. T
6. T	15. T	24. T	33. T	42. T	
7. F	16. F	25. T	34. T	43. T	
8. T	17. F	26. F	35. T	44. T	
9. T	18. F	27. T	36. F	45. T	

Part II

51. L	53. A	55. K	57. D	59. H
52. M	54. J	56. O	58. C	60. G

Part III

61. (1)	66. (4)	71. (2)	76. (2)	81. (1)
62. (3)	67. (2)	72. (3)	77. (2)	82. (3)
63. (4)	68. (3)	73. (4)	78. (4)	83. (3)
64. (3)	69. (1)	74. (3)	79. (4)	84. (4)
65. (2)	70. (2)	75. (2)	80. (1)	85. (3)

Part IV

86. instruments	94. draws	102. heavy
87. finished	95. triangles	103. parallel
88. vertical	96. distances	104. first
89. softwood	97. adjustable	105. scale
90. left	98. shield	106. dimensions
91. hardness	99. lay out	107. size
92. grade	100. center	108. length
93. two	101. heavy	109. circle
		110. dimensioning

EVERY PUPIL SCHOLARSHIP TEST

ROBERT P. JENSEN
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Directions: Read the directions for each part and follow them. Answer easy items first; return to others later. You will have exactly 40 minutes.

Part I

Directions: Read the following sentences carefully. If a statement is true, place a plus (+) in the parenthesis before the statement, as in example A below. If the statement is false, make a minus (—) in the parenthesis, as in example B.

Examples: (+) A. America was discovered by Columbus.
(—) B. The first president of the United States was Lincoln.

( ) 1. Plain-sawed lumber wears better than quarter-sawed lumber when used for wood floors.
( ) 2. A bevel and a chamfer are different names for the same shape of cut.
( ) 3. Varnish is thinned with turpentine.
( ) 4. Varnish will set more rapidly than shellac.
( ) 5. A number 8 wood screw is larger in diameter than a number 10 wood screw.
( ) 6. The number on an auger bit indicates the size in sixteenths of an inch.
( ) 7. A good mortise-and-tenon joint does not require glueing.
( ) 8. The try square and framing square have the same length blade.
( ) 9. Backsaws cut on the pull stroke.
( ) 10. Ordinarily a saw requires more set to work well in hardwood than in softwood.
( ) 11. When figuring board feet, half-inch lumber is figured as if it were an inch thick.
( ) 12. Board foot measure is determined by multiplying thickness in inches by width in inches by length in feet.
( ) 13. Linseed oil is extracted from cotton seed.
( ) 14. Spraying lacquer is a slow drying finishing material.
( ) 15. An isometric drawing shows three plane surfaces.
( ) 16. In mechanical drawing, dimension lines touch extension lines.
( ) 17. In a perspective drawing, lines which are parallel on the object are shown parallel on the drawing.
( ) 18. The upper edge of the T square should be used as a guide in drawing vertical lines.
( ) 19. Extension lines are light lines.
( ) 20. In mechanical drawing hidden lines are unbroken lines.
( ) 21. The flow of electricity is measured in amperes.
( ) 22. The outside shell of a dry cell battery is made of tin.
( ) 23. If a current is passed through a coil of wire, this coil becomes a magnet.
( ) 24. Tools should occasionally be greased to prevent rust.
( ) 25. The head of the brad is the same shape as the head of the finishing nail.
( ) 26. Shellac may be used as a filler.
( ) 27. Casein glue is made from the bones of animals.
( ) 28. The Bessemer converter is used to change pig iron to steel.
( ) 29. Tool steel contains less carbon than mild steel.
( ) 30. Water and air cause oxides to form on iron.
( ) 31. Cast iron contains no carbon.
( ) 32. Annealing copper or brass is done to harden the metal.
( ) 33. Annealing and tempering of metals refers to the same heat treatment.
( ) 34. A die is used to cut inside threads.
( ) 35. Taps and dies in a set are called screw plates.
( ) 36. When iron ore is melted, limestone is also put into the furnace.
( ) 37. Compared to other metals and alloys nichrome is a poor conductor of electricity.
( ) 38. A compass saw and a keyhole saw are the same shape.
( ) 39. The cutting points of the teeth of a ripsaw and a crosscut saw are the same.
( ) 40. White pine and walnut are both hardwoods.
( ) 41. The best mahogany wood grows in Canada.
( ) 42. Basswood is classified as a softwood.
( ) 43. Coping saws are used to cut curves in thin wood.
( ) 44. No. 1 sandpaper is coarser than No. 2/0 sandpaper.
( ) 45. Varnishing should be done in a cool room.
( ) 46. There are two adjustments for the blade of the jack plane.
( ) 47. An angle of 90 degrees is a right angle.
( ) 48. Most drawing boards are made of maple.
( ) 49. In soldering tinplate rosin is used as a flux.
( ) 50. Solder is made of tin and zinc.
( ) 51. Wood expands in wet weather.
( ) 52. Bronze is an alloy of copper and zinc.
( ) 53. T square and try square are different names for the same tool.
( ) 54. An expansive bit is used for boring holes larger than one inch.
( ) 55. Working drawings are usually orthographic projections.
( ) 56. Wood filler should be applied with a soft brush.
( ) 57. Both sides of the plane iron are ground as is the blade of a knife.
( ) 58. A center punch is used to punch holes in sheet metal.
( ) 59. Copper is galvanized to prevent it from rusting.
( ) 60. The surplus wood filler should not be removed from the wood until it has set one hour or more.
( ) 61. Box nails are made of lighter wire than common nails.
( ) 62. Heartwood of a tree is harder than sapwood.
( ) 63. The size of screws is given in length and wire gauge number.
( ) 64. Miter joints are usually used in the construction of picture frames.
( ) 65. Plain-sawed lumber costs more per foot than quarter-sawed lumber.
( ) 66. Auger bits are ordinarily used in a hand drill.
( ) 67. Arrow heads are placed on the ends of dimension lines.
( ) 68. Triangles are used in drawing horizontal lines in mechanical drawings.
( ) 69. The watt is a unit of measure for electrical power.
( ) 70. Newsprint paper is made from cotton and linen rag fibers.
( ) 71. A ream of paper contains 1000 sheets.
( ) 72. Seventy-pound stock paper means that 500 sheets of 25 by 38 size will weigh seventy pounds.
( ) 73. Casein glue must be applied hot.
( ) 74. Most of our soft pine comes from the southern part of the United States.
( ) 75. Birch and poplar are both recommended for a paint or enamel finish.

Part II

Directions: Place the number of the part which makes the best answer to the statement in the parenthesis before the sentence, as in the example.

Example: (3) The capital of the United States is: (1) Boston, (2) Chicago, (3) Washington, D. C., (4) New York.

In this example "Washington, D. C." is the correct answer; therefore, a figure "3" has been placed in the parenthesis.

( ) 76. The drawing pencil having the hardest lead of the following group is: (1) HB, (2) 2H, (3) 4H, (4) 4B, (5) B.
( ) 77. What metal makes up the greater portion of a tin can? (1) tin, (2) iron, (3) lead, (4) brass, (5) zinc.
( ) 78. An instrument used to lay out angles not found on the triangles is the: (1) architect's scale, (2) protractor, (3) divider, (4) compass.
( ) 79. An orthographic projection can show all views of a solid symmetrical cylinder by: (1) one view, (2) two views, (3) three views, (4) four views.
( ) 80. The base for wood filler is made from: (1) crushed wood, (2) sawdust, (3) crushed rock, (4) glue, (5) flour.
( ) 81. A tangent to a circle: (1) passes through it, (2) bisects it, (3) touches the outside, (4) forms a chord, (5) forms an arc.
( ) 82. The part of the auger bit which pulls it into the wood is the: (1) nib, (2) flute, (3) twist, (4) spur, (5) shank.
( ) 83. Center lines in drawings are shown as: (1) long lines of equal lengths, (2) light solid lines, (3) dotted lines, (4) alternate long and short lines.
( ) 84. A liquid is used on oilstones to: (1) wash out the steel chips, (2) keep the stone from wearing away, (3) make less friction.

( ) 85. Lines that represent edges that cannot be seen on the view should be shown by: (1) short dashes one half as heavy as the main object lines, (2) a light solid line, (3) a light line composed of alternate short and long dashes.
( ) 86. An assembly drawing is a working drawing used: (1) as an index to detail drawings, (2) for general illustration, (3) for a guide in assembling, (4) for all the foregoing purposes.
( ) 87. Copper is: (1) an alloy, (2) an element, (3) a chemical product.
( ) 88. The base for making lacquer is: (1) white lead, (2) fossil gum, (3) guncotton.
( ) 89. A skew is a: (1) scraping tool, (2) cutting tool, (3) polishing tool.
( ) 90. Brushes used in filler should be cleaned in: (1) alcohol, (2) thinner, (3) gasoline, (4) turpentine.
( ) 91. Brushes used in lacquer should be cleaned in: (1) alcohol, (2) thinner, (3) gasoline, (4) turpentine.
( ) 92. When grinding a chisel, the grinding wheel should: (1) revolve toward the tool, (2) revolve away from the tool, (3) remain motionless.
( ) 93. All dimensions should read from the: (1) bottom and right side, (2) left and bottom side, (3) top and left side.
( ) 94. Which one of the following glues is waterproof? (1) animal, (2) casein, (3) fish, (4) Le-Pages.
( ) 95. Before applying a finish, which of the following woods requires a filler? (1) pine, (2) maple, (3) walnut, (4) cherry.

Part III

Directions: From the list of answers in Column II select the word which matches each item of Column I, and write the number of the answer in the parenthesis at the left of the item.

Column I

( ) 96. A type of drawing
( ) 97. The tool used to cut outside threads
( ) 98. A wood used in making model airplanes
( ) 99. A solvent for animal glue
( ) 100. A means of softening hammered copper
( ) 101. A solvent for shellac
( ) 102. A polishing agent used on metals
( ) 103. The metal in a lamp bulb filament
( ) 104. A saw used to cut metal
( ) 105. A tool used in sharpening a hand scraper
( ) 106. The voltage of four dry cells in parallel
( ) 107. The wire size of common bell wire
( ) 108. The number of times aluminum is heavier than water
( ) 109. The number of inches represented by (2′ 10″)
( ) 110. The number of degrees in a right angle
( ) 111. A wood commonly used in cheap furniture to imitate walnut or mahogany
( ) 112. Layers of thin wood glued together
( ) 113. The metal used to coat iron in making galvanized iron
( ) 114. A holding device used so that the saw will make a square cut on the board
( ) 115. A type of crushed stone facing for sandpaper used on wood
( ) 116. A type of paper used for stationery
( ) 117. A polishing material used for gold or silver
( ) 118. A wood containing wide sap streaks
( ) 119. A trade name for a transparent plastic
( ) 120. The kind of wood in the giant trees in California

Column II

1. alcohol
2. annealing
3. balsa
4. bond
5. burnisher
6. hack saw
7. cottonwood
8. die 9. fir
10. flint
11. gasoline
12. gumwood
13. iron
14. lead
15. miter box
16. nitric
17. oak
18. perspective
19. plexiglass
20. plywood
21. redwood
22. ripsaw
23. rouge
24. tap 25. tin
26. tripoli
27. tungsten
28. twist drill
29. vise
30. water
31. zinc
32. 1.5 33. 2.7
34. 3.6
35. 5 36. 6
37. 12 38. 18
39. 24 40. 34
41. 90 42. 180

KEY — Part I

Papers must be scored according to this key. Give one point for each correct answer. An omission is counted as an error.

Possible score 120

1. (—)	14. (—)	27. (—)	40. (—)	53. (—)	66. (—)
2. (—)	15. (+)	28. (+)	41. (—)	54. (+)	67. (+)
3. (+)	16. (+)	29. (—)	42. (+)	55. (+)	68. (—)
4. (—)	17. (—)	30. (+)	43. (+)	56. (—)	69. (+)
5. (—)	18. (—)	31. (—)	44. (+)	57. (—)	70. (—)
6. (+)	19. (+)	32. (—)	45. (—)	58. (—)	71. (—)
7. (—)	20. (—)	33. (—)	46. (+)	59. (—)	72. (+)
8. (—)	21. (+)	34. (—)	47. (+)	60. (—)	73. (—)
9. (—)	22. (—)	35. (+)	48. (—)	61. (+)	74. (—)
10. (—)	23. (+)	36. (+)	49. (+)	62. (+)	75. (+)
11. (+)	24. (+)	37. (+)	50. (—)	63. (+)	
12. (—)	25. (+)	38. (+)	51. (+)	64. (+)	
13. (—)	26. (+)	39. (—)	52. (—)	65. (—)	

Part II

76. (3)	80. (3)	84. (1)	88. (3)	92. (1)
77. (2)	81. (3)	85. (1)	89. (2)	93. (1)
78. (2)	82. (4)	86. (4)	90. (3)	94. (2)
79. (2)	83. (4)	87. (2)	91. (2)	95. (3)

Part III

96. (18)	101. (1)	106. (32)	111. (12)	116. (4)
97. (8)	102. (26)	107. (38)	112. (20)	117. (23)
98. (3)	103. (27)	108. (33)	113. (31)	118. (9)
99. (30)	104. (6)	109. (40)	114. (15)	119. (19)
100. (2)	105. (5)	110. (41)	115. (10)	120. (21)

PERCENTILE DISTRIBUTION — 1946 TESTS

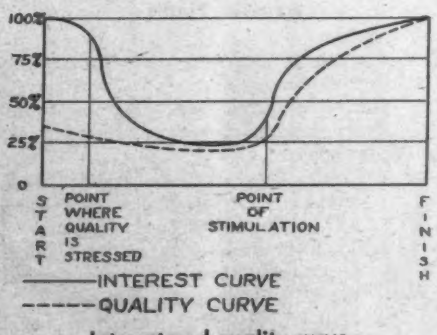
Possible score	120
Highest score	105
99	102
95	90
90	85
85	81
80	78
75	76
70	74
65	73
60	71
55	70
50	68
45	66

Possible score	120
40	65
35	63
30	61
25	60
20	58
15	55
10	52
5	48
1	41
Lowest score	31
No. of cases	963

DEFEAT THE INEVITABLE LULL

DAVID O. TAXIS
Junior High School
Downey, Calif.

The project interest curve shown herewith is approximately correct for the average junior high school boy. At the start of a good project, boy interest soars to the top. The student's enthusiasm is so great that he frequently disregards quality of work in his eagerness to assemble and complete the job. The instructor's problem is to slow down the boy so as to increase the quality of work. This slowing down is an automatic damper to the boys' enthusiasm. That means that the teacher must do something to stimulate the boy's interest again. Here is a suggestion that works quite well.



Interest and quality curve

If the starting of a project is well timed so that it can be finished at some anniversary such as Mother's Day, Christmas, or Father's Day, interest may again be made to soar to a high point. For example, suppose we start a tie rack about the tenth of May. Normal completion time is about four weeks. After approximately two weeks, when interest has waned, remind the student that the tie rack will make a wonderful gift for Father's Day and then watch interest again climb to a high point.

Problems and Projects

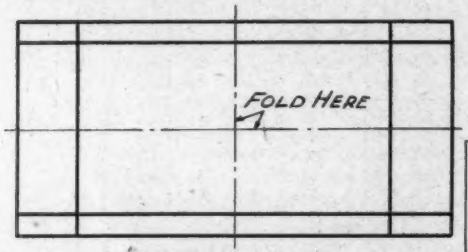
HOW TO MAKE A DESK TRAY

MARTIN PETERSON
Cincinnati, Ohio

This tray is useful on a desk to hold cards, letters, pencils, and erasers.

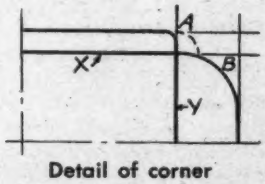
Read all the directions before attempting item No. 1.

1. Draw the bottom of the tray full-sized on drawing paper.
2. Add the height of the two long sides to the width of the tray pattern.
3. Add the lengths of the ends of the tray to the length of the bottom of the tray. Your pattern will look like this:



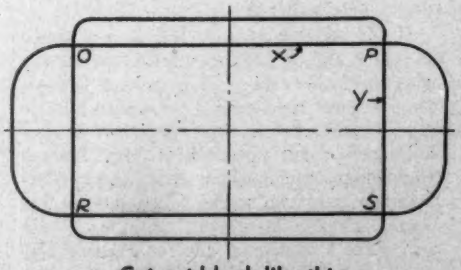
Layout for tray

4. Cut along the outsides of the pattern.
5. Fold the pattern both end-to-end and lengthwise.
6. Round the corner at A with a compass set at ½ in.
7. Draw a curved line as at B.



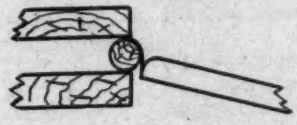
Detail of corner

8. Cut along these lines with a scissors.
9. Open the pattern, and fold along lines X and Y.
10. Check your pattern for size and completeness.
11. Measure the width and length of the pattern.
12. Obtain a piece of sheet metal this size.
13. Trace the pattern accurately with a sharp pencil.

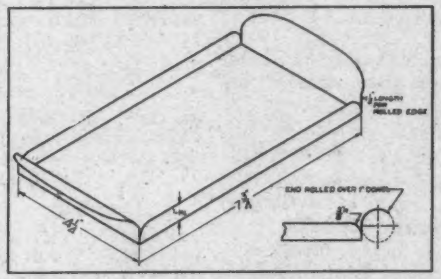


Cut out blank like this

14. Fold the pattern at the ends and draw along the folds.
15. Cut along the outline with tin snips.
16. Lay line O–P over a steel-edged bench.
17. Hold the metal down with a heavy iron.
18. Press down on the overhanging edge and bend at line X.
19. Tap lightly with a mallet along this edge until a sharp bend is made.
20. Bend similarly at R–S.
21. Bend ends at O–R and P–S.



Roll end over dowel as shown



Desk tray

22. Roll end of tray over a ¾-in. dowel placed between wooden vise jaws as shown.
23. Polish the metal with steel wool. Use emery cloth on edges when necessary.
24. Apply lacquer, or enamel, when color is desired.

AERONAUTICS

WILLIAM E. NAGEL
Washington Community High School
Washington, Ill.

(*Continued from page 416 of the November, 1946, issue*)

UNIT IV
Power Plants

I. Function
A. The job of the engine is to convert the potential energy of fuel into heat energy which the engine turns into mechanical energy, which in turn revolves the propeller.
B. Development
1. Langley's engine — a five cylinder which developed 52.4 horsepower and weighed 207½ lb. or 3.96 lb. per horsepower.
2. Wright brothers — four cylinder in-line, developed 12 horsepower and weighed 180 lb., or 15 lb. per horsepower.
3. Pratt-Whitney 2200 horsepower radial which weighs about 2500 lb., or just a little over 1 lb. per horsepower.

II. Size and location of the power plant
A. Tractor type
1. Single engine (fuselage)
2. Two engine (wing nacelle)
3. Single raised engine (wing nacelle; raised)
4. Four engine (wing nacelle)
B. Pusher type
1. Single engine (Fleetwing seaplane)
2. Two engine

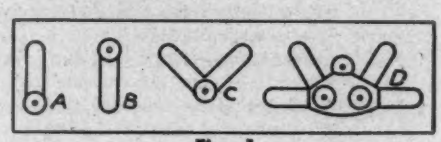


Fig. 1

III. Engine types
A. Vertical single row (Ranger). See *A*, Figure 1.
B. Inverted single row (Ranger). See *B*, Figure 1.
C. *V* type (Curtiss D-12 or Allison). See *C*, Figure 1.
D. Double *V* or *W* type (not made at present). See *D*, Figure 1.
E. Opposed or flat (Lycoming). See *E*, Figure 2.
F. *X* type (Menasco; not made at present). See *F*, Figure 2.

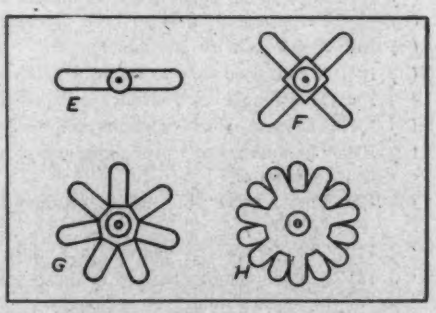


Fig. 2

G. Radial (Wright or Pratt-Whitney). See *G*, Figure 2.
H. Double radial (same as the above listed types). See *H*, Figure 2.
I. Liquid cooled — cast circulating system in the block and liquid and radiator so that air eventually does the cooling.
J. Air cooled — baffles direct air into large oversize fins for cooling.

IV. Principles of operation
A. External and internal combustion engines
1. Steam engine where fuel is burned outside the engine in a firebox is external.
2. Gas engine where fuel is burned within the engine cylinder.

a) Fuel charge does not explode but is based upon two physics laws:
1) Boyle's law — (at constant temperature the volume of a gas varies inversely with the pressure exerted).
(*a*) First step in developing power consists of decreasing the volume of the gas mixture in the cylinder for the purpose of raising the temperature.
2) Charles's law — (when volume remains constant, the pressure varies directly in proportion to the temperature changes).
(*a*) The combustible compressed gases are burned; their temperature is thus raised and their pressure is increased proportionately.

B. Essential engine parts
1. Carburetor to vaporize the liquid fuel and mix it with the correct amount of air to form a combustible mixture.
2. Cylinder is where the gases are burned.
3. Piston within the cylinder — the pressure on top of it by the heated gases pushes it downward.
4. This downward motion causes the crankshaft to rotate.
5. The propeller is attached to the crankshaft and rotates with it.
6. Valves or ports must be provided in the cylinder to permit the fuel charge to enter and the burned gases to escape.
7. Cycle is the series of events required to place the gases within the cylinder and compress, ignite, burn, and discharge the burned gases from the cylinder.

C. Two-stroke cycle
1. As the piston moves upward it closes the transfer and exhaust ports, trapping the fuel in the top of the cylinder and compresses it. See Figure 3. Then the mixture is ignited by the spark plug. The increase in pressure from the burning gas pushes the piston downward. This is the power stroke, or the impulse stroke. As the piston nears the bottom of the stroke the exhaust port is uncovered and the gases escape. Each upward stroke of the piston reduces the pressure in the crankcase beneath. As the piston nears the top of its stroke the pressure permits the new charge of fuel to be drawn into the crankcase. The upward stroke draws a new charge of fuel into the crankcase and compresses the charge already in the cylinder. The downward or power stroke permits the burned gases to escape and a new fuel charge enters the top of the cylinder. One full revolution of the crankshaft or two strokes of the piston is required for a full cycle.
a) The difficulties with this type are:
1) Cannot idle
2) High fuel consumption
3) Hard to cool the cylinders

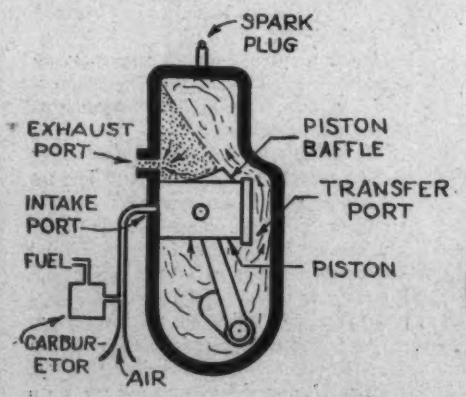


Fig. 3. Two-stroke cycle

D. Four-stroke cycle (called the Otto cycle)
1. Intake stroke. See *A*, Figure 4. The piston is at top dead center and moves downward. The reduction of the pressure causes the mixture to come into the cylinder.
2. Compression stroke, *B*, Figure 4. The piston moves upward compressing the fuel mixture.
3. Power stroke, *C*, Figure 4. The piston moves downward, has moved through 20 deg. to 30 deg. before top dead center when the mixture begins to burn. When the piston reaches top dead center the mixture is ready to start violent expansion. The combustion rate is about 100 ft. per second or 68 miles per hour. The temperature is about 4500 deg. F., and from 125 to 550 lb. per sq. in. increase in pressure takes place. Expansion by explosion has ceased from 8 deg. to 30 deg. before bottom dead center.
4. Exhaust stroke. See *D*, Figure 4. The piston moves upward. The exhaust valve is open to clear the cylinder. The valve closes about 8 deg. to 35 deg. after top center to permit complete clearing of gases from the cylinder.
5. Valve overlap

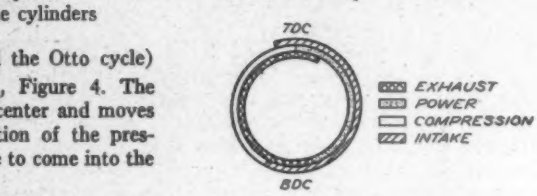


Fig. 4. The four-stroke engine

Fig. 5. Valve overlap

E. Diesel fired by compression or automatic ignition of fuel oil.
1. Only air is drawn into the cylinder and compressed on the compression stroke.
2. Because of the high compression the temperature of the air is raised above the igniting temperature of the oil used.
3. Fuel oil is injected under high pressure into the combustion chamber. When the oil comes in contact with the hot air it burns immediately.
4. The pressure in the cylinder is greatly increased and the power impulse given to the piston.
5. Disadvantages
a) Sluggish throttle
b) Hard to start in cold weather
c) Disagreeable exhaust odor
6. Advantages
a) Great savings in fuel cost
b) Practically no fire hazard in crashes

V. Principal parts of an engine. (Parts are listed only. They will be discussed and explained later when again brought into the outline).
A. Crankcase (in-line; radial; opposed)
B. Cylinder assembly
C. Valves
D. Pistons
E. Connecting rod assembly
F. Crankshaft
G. Valve operating mechanism
H. Accessory drives
I. Propeller reduction gears

VI. Cooling systems
A. Methods of cooling oil
1. Air
a) Returning oil may pass through a chamber that surrounds the intake manifold — both cooling the oil and

heating the fuel mixture.

b) An air blast is directed against the sides of the tank to assist in cooling the oil. A shutter can deflect the air, and control the oil temperature somewhat.

2. Oil cooler — a small radiator connected to the lubricating system and located outside the engine cowling. Operated on the same principle as a water radiator. Sometimes shutters are placed in front of the radiator to help control the temperature.

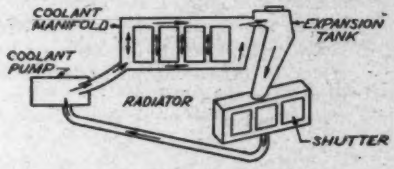


Fig. 6. Cooling engine with a liquid

B. Methods of cooling the engine

1. Liquid cooled. See Figure 6. Coolant (ethylene glycol), similar to Prestone, circulates through a water jacket surrounding the cylinders and through a radiator exposed to the air. All radial engines are air cooled — only other types are liquid cooled.

a) Advantages

1) More uniform cooling
2) Smaller frontal area — less head drag
3) Greater streamlining possibilities
4) Not such a great possiblity of overheating
5) Greater choice of engine location as radiator may be placed anywhere

b) Disadvantages

1) Heavier per horsepower
2) Not so compact a unit
3) More vulnerable in military use
4) Subject to plumbing difficulties
5) Not so efficient because of lower operating temperature
6) Freezing or boiling at extreme temperatures

2. Air cooling. See Figure 7. Heat passes directly from engine cylinders to the surrounding air (exhaust valve is heated and the fins help dispel the heat).

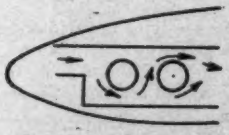


Fig. 7. Air cooled engine

a) Disadvantages

1) Chilling and probable stopping of the engine in long glides in cold weather.
2) More danger in overheating and damaging the valves.

VII. Carburetion

A. Fuel systems provide storage space for the fuel and deliver it to the carburetor at the proper rate and pressure.

1. Gravity feed fuel system. Tanks are located above the carburetor. A very simple, reliable system with no parts to get out of order. Cannot be used on any model where the tanks are lower than the carburetor nor for high pressured planes because of the low pressure.

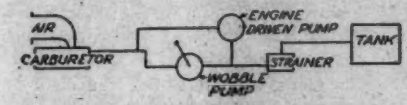


Fig. 8. Pressure feed fuel system

a) They consist of a fuel tank, fuel gauge, fuel cock, strainer, and a primer.

2. Pressure feed fuel system. See Figure 8. Makes use of an engine driven fuel pump which draws fuel from the tank and delivers it to the carburetor.

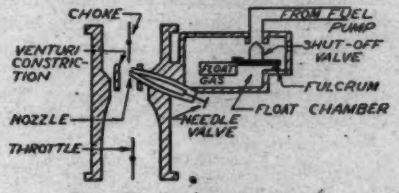


Fig. 9. Carburetor unit

B. Carburetor Units. See Figure 9.

1. Float mechanism — a mechanism to maintain the fuel at a constant level in the float chamber.
2. Main jet system — nozzle or main jet is located slightly above the fuel level in the float chamber. The fuel is sprayed through this jet into the incoming air stream. The incoming air sets up a reduced pressure that draws the fuel through the jet.
3. Venturi tube — a small area of decreased air pressure surrounding the tip of the jet is provided by a construction in the air passageway. Application of Bernoulli's theorem.
4. Throttle valve — regulates the amount of fuel-air mixture entering the cylinders.
5. Idling system — at low speeds main jet will not function. The idling jet (just above the throttle valve) is not affected by the venturi and the air under high suction draws out the fuel mixture to keep the engine running.

C. Fuel injection. The mechanical fuel injector, shown in Figure 10, is driven by the engine. Fuel is drawn into the injector pumps and discharged by engine-driven cam action to the intake pipes of each cylinder. Each intake pipe has a nozzle to spray the fuel into the stream of air. Very carefuly regulated, same as the valve action.

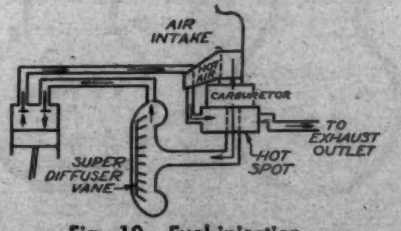


Fig. 10. Fuel injection

1. Advantages

a) Not affected by position of the plane
b) Accurate fuel measurement to each cylinder for smoother engine operation
c) More power because there are no restrictions in air intake passageways
d) No icing in injection system

D. Superchargers. Engine power varies with the pressure of the air entering the cylinders.

1. Ones in use are of the centrifugal type. The impeller is a disk driven by the engine. The air enters the impeller near the center and is thrown out by centrifugal force through the vanes and directed to the intake pipes of each cylinder. See Figure 11.

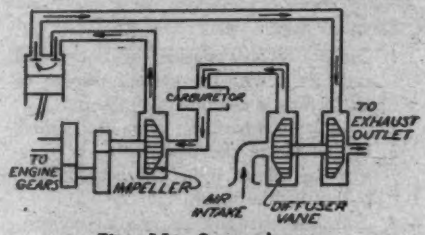


Fig. 11. Supercharger

VIII. Ignition and spark

A. Ignition system principles

1. Source of energy — either storage battery or a magneto must be provided.
2. Current must be high voltage and this low voltage of the magneto must be boosted by the induction coil.
3. The spark must be delivered to each cylinder at the proper time and the distributor does this work. A breaker mechanism must also be used to interrupt the current at a predetermined time.
4. Spark plug — where the spark occurs.
5. Switch — is necessary to stop the engine at any time by cutting off the electrical power.

B. How the system works

1. Magneto action — rotating magnets induce a current in the primary windings of the induction coil. The induced current is alternating.
2. The induction coil builds up the voltage to approximately 20,000 volts. The induction coil is sometimes called the secondary coil. The current flowing in the primary by reversing the field (N and S poles) induces a current in the secondary or induction coil.
3. Breaker mechanism — two metal contact points opened and closed by a cam on the rotating magnet shaft. A complete circuit is formed in the primary when both points are closed. When the points

are opened, a terrifically high voltage is induced for only a moment in the secondary winding of the coil. The timing of the breaker points is regulated to cause a spark in the cylinder at a particular instant in the cycle of operation of the engine.

4. Condenser — a metal insulator that has two purposes in the system.
   a) Eliminates arcing (jumping a spark) across the points.
   b) Cuts off the primary current more sharply.
5. Distributor — a device used to carry the high voltage from the secondary coil and distribute it to each cylinder at a definite time in the cycle of operation. It has a terminal for each cylinder employed and these terminals are molded into rubber. The secondary coil is connected to a rotor which travels in a circular path to make contact with all the terminals in one revolution. Highly insulated wires lead from each terminal in the distributor to a spark plug in the cylinder. The distributor is so timed that every time the breaker points are opened (high voltage in the secondary coil is induced) the rotor segment is in contact with a terminal in the distributor. From this terminal runs a wire to a cylinder ready for ignition.
6. Spark plug — two wires extending into the cylinder with an air gap between (.015–.025). The central electrode is connected to the high voltage wire from the distributor terminal. The other wire completes a circuit to the cylinder. When the breaker points are opened the high voltage jumps the small air gap and ignites the fuel mixture.
7. Switch — used to control the engine by cutting-off ability. It has an *Off*, *R*,*L*, and *Both* position to check each magneto.

C. Dual magneto ignition system
   1. In order to make doubly sure that a spark will occur in the cylinder, aircraft engines are required to have two complete magneto systems which serve two complete sets of spark plugs in the engine. More power is possible if both plugs fire and there is greater reliability in case one fails to fire.

IX. Fuels

A. Common liquid fuels suitable for internal combustion engines.
   1. Benzol — a coal tar distillate. High ignition temperature which permits a high pressure without detonation.
   2. Alcohol — made from grain; not a hydrocarbon, as it has oxygen in it. Can have high compression due to high ignition temperature. Has a great affinity for water. It is costly to produce.
   3. Gasoline — a hydrocarbon with a higher heat value per pound than other fuels.
      a) Straight run gasoline — from fractional distillation.
      b) Cracked gasoline — destructive distillation used commercially by blending it with straight run or casing head gasoline. More gasoline can be obtained by this method.
      c) Casing head gasoline — highly volatile gasoline, by absorption process crude oil is distilled to get it. Not in common use.

B. Fuel properties
   1. Volatility (tendency to evaporate) (distillation)
   2. Vapor pressure (test bomb)
   3. Detonation (knock)
   4. Octane rating (iso-octane, high anti-knock rating of 100; heptane has a rating of 0; average from 73–100)
   5. Purity — no water or foreign substances

X. Lubricants

A. Lubricants available
   1. Mineral oils — used almost exclusively for internal combustion engines. A by-product of crude petroleum.
      a) Naphtenic base crude — a high per cent of asphalt. Great change in viscosity with temperature changes. Comes from California and Gulf Coast fields.
      b) Paraffin base crude — low viscosity — highest grade of lubricants come from New York, Pennsylvania, and West Virginia.
      c) Mixed base crude — have properties of both of the above. Predominate in Mid-continent and Mexico.

B. Tests used to compare lubricants
   1. Visible impurities
   2. Corrosive constituents (sulphur on copper)
   3. Viscosity (Saybolt viscosimeter — 80 cc. are heated to 210° F. and then run out into a pan. Time it takes for 60 c.c. to run out is the rating. SAE rating is one half Saybolt rating.)
   4. Pour point
   5. Flash and fire points
   6. Carbon residue (0.6 per cent for SAE No. 40)

XI. Starters

A. Types of starters (must be able to operate engine at 100 r.p.m. to bring carburetion and ignition to a point of operation).
   1. Hand cranking — used for low horsepower units not over 500 horsepower. By a series of reduction gears the mechanism is able to turn the engine over at the proper speed for operating.
   2. Hand inertia starter — a small flywheel which is rotated rapidly and this rotational energy is used to crank the engine (a five-pound flywheel turning at 12,000 r.p.m. has about 5000 foot-pounds of energy — will raise a 100 pound weight over 50 feet in the air).
   3. Electric inertia — same principle as the hand inertia but the turning is accomplished by an electric motor with which the starter is equipped.
   4. Cartridge type starter — a cartridge resembling a shotgun shell is placed in the breech of the starter and ignited electrically. The piston of the starter is pushed down and engages the clutch jaw of the starter with the clutch jaw of the engine. The motion starts the crankshaft turning at a speed for engine operation.

XII. Propellers

A. Purpose of the propeller is to provide the force to move the plane forward through the air.

B. Types
   1. Fixed pitch (wood or metal blades) — no adjustment possible for angle of pitch. Made of laminated wood or forged aluminum alloy with a steel sleeve.
   2. Adjustable pitch — movable blades in a hub that is adjustable to pitch angles while the plane is on the ground. Moves about 13 to 16 deg. Wooden bladed adjustable propellers are on planes of less than 100 horsepower.
   3. Controllable pitch — the pitch angle can be changed during flight. Equipment is fairly heavy but in 2000 horsepower airplanes the extra weight is not a major factor. Most models are hydraulic. Centrifugal force acts on the counterweights to change the blade.
   4. Constant speed — automatically maintains the engine at the same speed by a governor. Used mostly on transport planes where the most economical setting is desired. Hydraulically operated.
   5. Feathering propeller — hydromatic or electric — usually electric. It has a motor on the front end of the hub and is powered by a storage battery. Two stage planetary gear speed reduction to produce slow speed blade angle changes. Ratio is about 36,000 to one.

NOTEBOOK STAND

DAVID MacMILLAN
Roosevelt High School
Portland, Ore.

The typewriter bookstand shown and described in this article was designed for the commercial department, to serve as a convenient holder for the standard classbook in typing, and at the same time admit of the correct posture while using the typewriter. The stand is placed at the right of the typewriter on the standard size typewriter table.

BILL OF MATERIAL

Item	*No. required*	*Size*
A	1	⅜ x 8 x 14½
B	1	⅜ x 5⅞ x 10¾
C	1	⅜ x ⅜ x 8
D	1	1¾ x 2¾ x 8

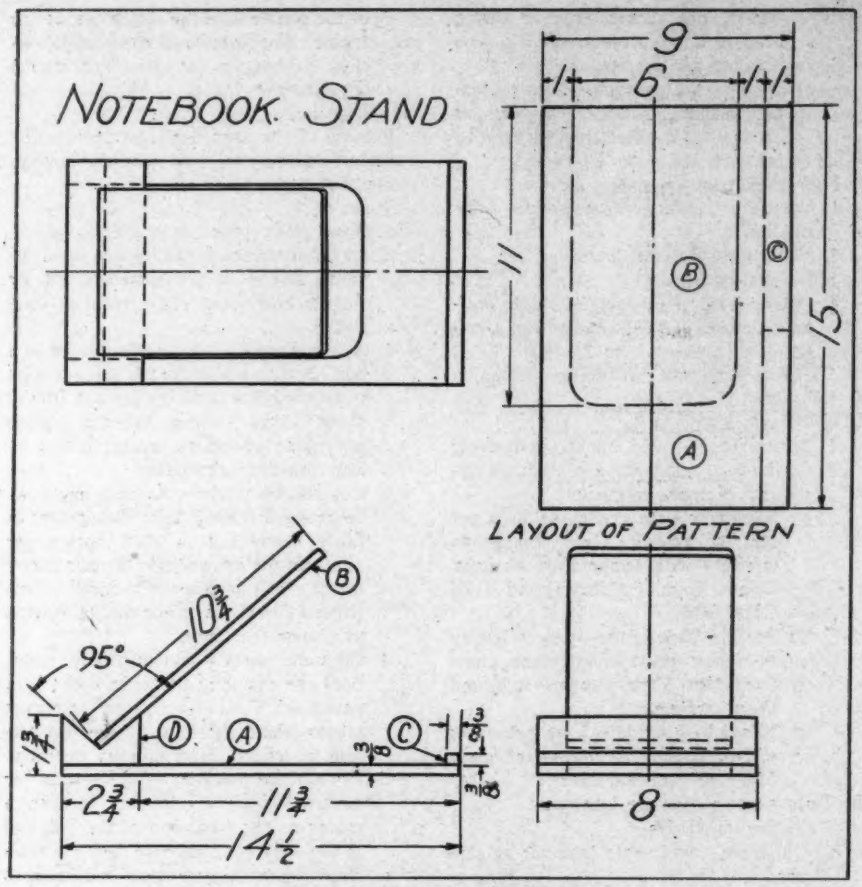
1. Lay out pieces *A*, *B*, and *C* on a ⅜ by 9 by 15-in. piece of plywood as shown in the illustration. This allows for waste in bandsawing.

2. Mark off angle of 95 deg., on end of block *D*, and cut out the groove with a handsaw, a circular saw, or a band saw.

3. Item *C* is cut from the side of piece *A*.

4. All pieces are smoothed on edges with plane and the corners are rounded off slightly.

5. Item *B* is glued to block *D*, and fastened with screws.



Details of notebook stand

6. Glue base *A* to block *D* and fasten it with screws.

7. Item *C* is glued and braded to top of base *A*.

8. Sand all surfaces and then give the entire project two coats of shellac. Sand between coats. Finish with either wax or varnish.

GRINDING AND SHARPENING A PLANE IRON

HERMAN P. ESCHNER
Lorraine School No. 72
Buffalo, N. Y.

Most mechanics and shop instructors sharpen tools by the trial-and-error method which takes up some time. There is an easier way to do it. I developed this formula some thirty years ago and it has saved me many long hours of hard work. It takes the guess — the trial and error out of sharpening flat and beveled edge tools.

During the past twenty years, this system has been taught to over fifty practice teachers under my care and they have found this new method much easier and more certain.

First, it is necessary to have a true oilstone. A heavy piece of sheet iron, about 12 by 16 in., makes a good rubbing surface. Place some medium carborundum powder with a light machine oil in the center of this sheet, rub in a circular motion, and in a very short time the stone will be true. To keep the stone true, do this about twice a year. This will keep the flat side of the tool true and the beveled edge as nearly straight as possible.

The following instruction sheet has been used regularly and many of the boys in the grades do a better job with sharper tools.

Grinding and Sharpening a Plane Iron

Sharp tools are necessary to produce the best kind of work in the shortest time possible. It is also a safety measure because dull tools are more likely to cause injury. This lesson applies to all flat tools with a beveled edge.

Tools and Materials:

Plane iron, grinding wheel, oilstone, light oil, waste cloth.

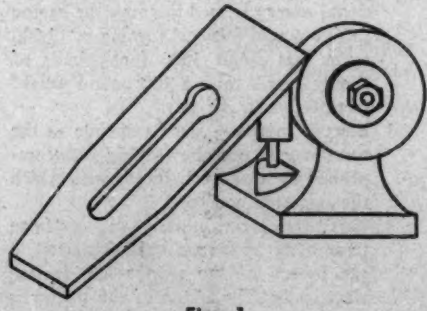


Fig. 1

Operations — Grinding:

1. Set the tool rest so that the wheel will grind an angle of 25 deg. Turn on the power. Move the blade back and forth across the face of the wheel until all the nicks and the dull edge are removed. *Keep the blade at the proper angle at all times.* See Figure 1.

2. Check the edge for squareness from one edge of the plane iron only, and always from the same edge. See Figure 2.

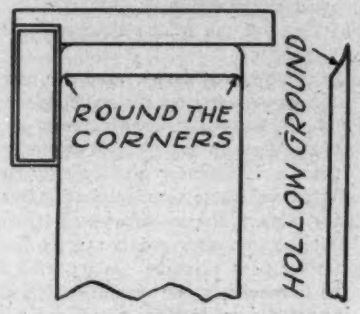


Fig. 2

3. Round off the corners slightly. See Figure 2.

Whetting the Plane Iron

1. Keep the oilstone true.
2. Wipe off the stone with waste cloth.
3. Apply a few drops of light oil.
4. Place the bevel edge of the plane iron on the face of the oilstone.
5. Raise the heel of the bevel slightly as shown in Figure 3.

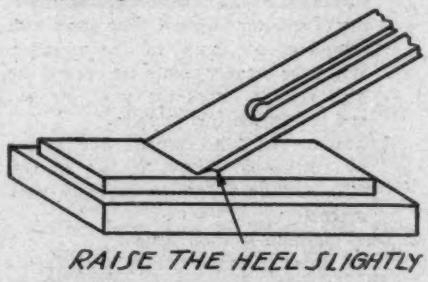


Fig. 3

6. Now *keep the wrist stiff*. Allow the arm to move at the elbow and the shoulder *only*.

7. Move the plane iron back and forth across the face of the oilstone with moderate pressure about 20 times. Do each corner also.

8. Turn the blade over on the flat side and repeat the 20 strokes. *Keep the blade flat on the oilstone. Do not raise it at any time.*

9. Replace on the bevel edge and take 10 strokes. Corners too.

10. Turn over on the flat side and repeat 10 strokes.

11. Back on the bevel. Five strokes back and forth.

12. Back on the flat side 5 strokes.

13. Now 3 strokes on the bevel side.

14. And 3 strokes on the flat side.

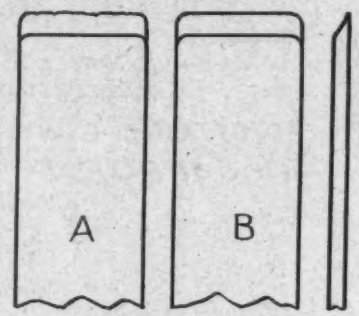
15. Then 2 strokes on the bevel and 2 on the flat side.

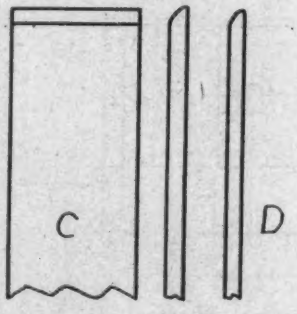
16. Now take several light strokes on the

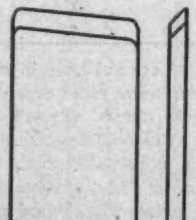
bevel side, then on the flat side. *The plane iron should now have a very keen edge.*

Questions for Discussion

1. At what angle is the plane iron ground?
2. How is the edge of the plane iron ground?
3. How are the corners of the plane iron ground?
4. What happens when the plane iron turns a dark blue?
5. Why is the edge of the plane iron tested for squareness from the same edge each time?
6. Why are the corners of the plane iron rounded?
7. Why should the face of the oilstone be kept true at all times?
8. How is the stone prepared for use?
9. How should the wrist be held?
10. What part of the arm moves while sharpening the plane iron?
11. How should the heel of the bevel be placed?







12. Why is it necessary to keep the flat side of the plane iron flat on the oilstone at all times?
13. What is the formula to be carried out in the sharpening of a plane iron?
14. Why is the glass guard placed over the wheel?
15. What is necessary to do before leaving the grinder?
16. Which of the plane irons shown at *A*, *B*, *C*, *D*, and *E*, would you grind and whet?
17. Which would you sharpen by whetting only?

BED READING RACK

GERRY DE MEY
Central Islip, N. Y.

This bed reading rack is designed to include both woodworking and metalwork. It is a very practical project and can be used in any bedroom.

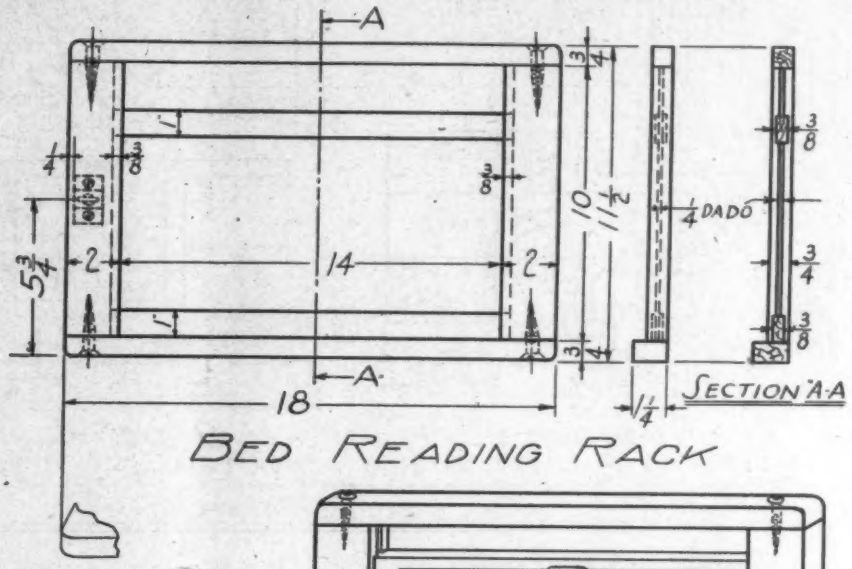
The base and frame are made of gumwood, finished with shellac, rubbed with wet dry sandpaper, and waxed.

The braces are made of ⅛ by ¾-in. band iron and are drilled, tapped, and bent as shown.

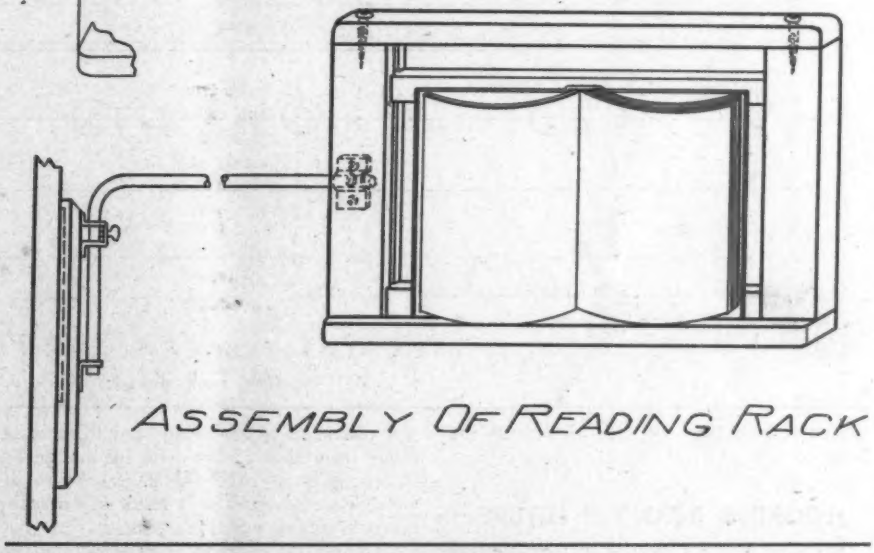
The rod is made of ⅜-in. cold roll steel and is bent as shown.

The bookrack can be raised or lowered by adjusting the thumbscrew on the brace on the base. The book frame can be adjusted to any angle by adjusting the thumbscrew on the book frame. With these two adjustments, all eyestrain may be avoided.

When the bookrack is not in use it can be



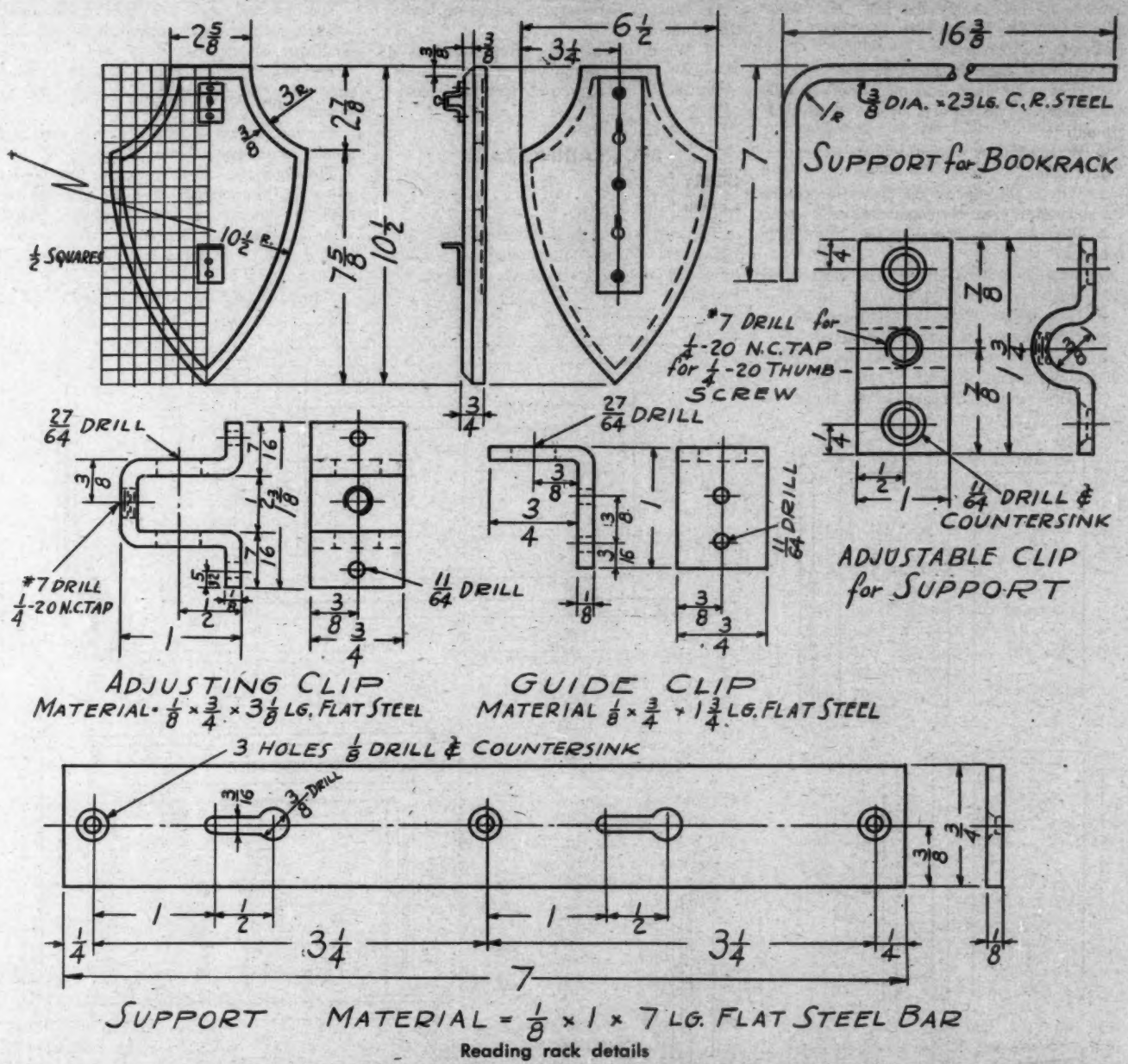
BED READING RACK



ASSEMBLY OF READING RACK

BILL OF MATERIALS

No. of pcs.	*Part*	*Material*	*Size*
1	Base	Gumwood	¾ x 7 x 11 in.
2	Rack ends	Gumwood	¾ x 2 x 12 in.
1	Rack top	Gumwood	¾ x ¾ x 18 in.
1	Rack bottom	Gumwood	¾ x 1¼ x 18 in.
2	Rack slides	Gumwood	⅜ x 1 x 15 in.
3	Braces	Band iron	⅛ x ¾ x 4 in.
1	Base hook	Band iron	⅛ x ¾ x 5½ in.
1	Rod	Cold roll steel	⅜ in. diameter
6	Wood screws	R.H.	¾– 8 in.
3	Wood screws	F.H.	¾– 8 in.
4	Wood screws	F.H.	1½– 8 in.
2	Thumbscrews	Steel	¼–20 N.C.


SUPPORT for BOOKRACK
ADJUSTABLE CLIP for SUPPORT
ADJUSTING CLIP
MATERIAL - 1/8 x 3/4 x 3 1/8 LG. FLAT STEEL
GUIDE CLIP
MATERIAL 1/8 x 3/4 x 1 3/4 LG. FLAT STEEL
3 HOLES 1/8 DRILL & COUNTERSINK
SUPPORT MATERIAL = 1/8 x 1 x 7 LG. FLAT STEEL BAR

Reading rack details

turned against the wall with or without the book.

LOOKING INTO THE FUTURE

Speaking before a meeting of the American Institute of Mining and Metallurgical Engineers at the Waldorf Astoria, Dr. Jeffries, general manager of General Electric Company's chemical department, predicted that development of new techniques in metallurgy will result from nuclear energy research. He cited the use of radioactive tracers and controls as a method of determining the effects of a minute amount of impurities in metals.

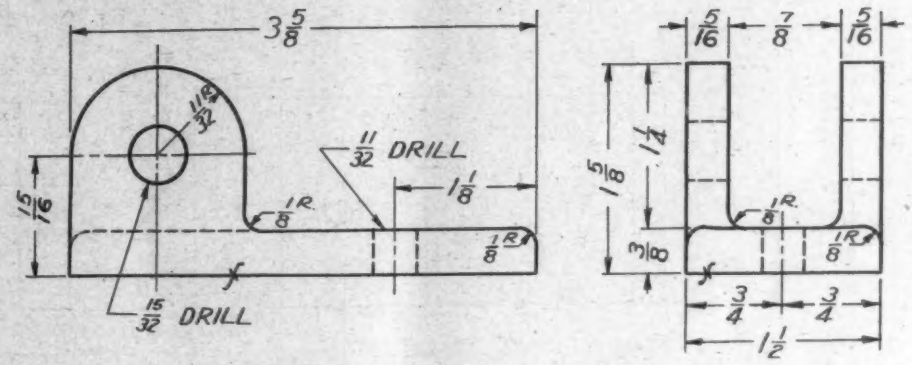
In predicting great expansion of the lightweight metal industry, the General Electric official asserted that continued development of new plastic materials would tend to increase rather than lessen the need for the metals. As an example, he cited the increased use of metal in automobiles as a result of advancements in rubber, which is a plastic.

"Nothing on a broad front can take the place of metals," Dr. Jeffries said. "The science of metals is keeping pace with other sciences and since now science is leading the art in many instances, the metals relative to other materials should find their competitive place in the future economy."

The speaker pointed out that the production of metals would have to multiply seven times if the rest of the world were to attain the same standard of living as the United States. Such a tremendous expansion, he said, would necessarily extend far into the future. Although iron and steel are available in sufficient quantity to permit more rapid expansion than some of the other metals, nevertheless, the other metals "are available in ample quantities to provide a rich industrial economy."

"There will be more efficient utilization of the metals. High cost metals will be used more in combination with low cost materials. Alloys having long life will be given a high economic rating by designers and users. Engineers will be able to analyze the stresses in machines and structures so much better than now that safety factors can be greatly reduced. Tens of thousands of new combinations of properties will be provided by alloys of the future, each combination serving some particular use better than any other," he said. The future of metallurgy presents a fertile field of conjecture.

Job 27. Draw a top view of the double lug bearing.
Purpose: To teach the reading of a top view.



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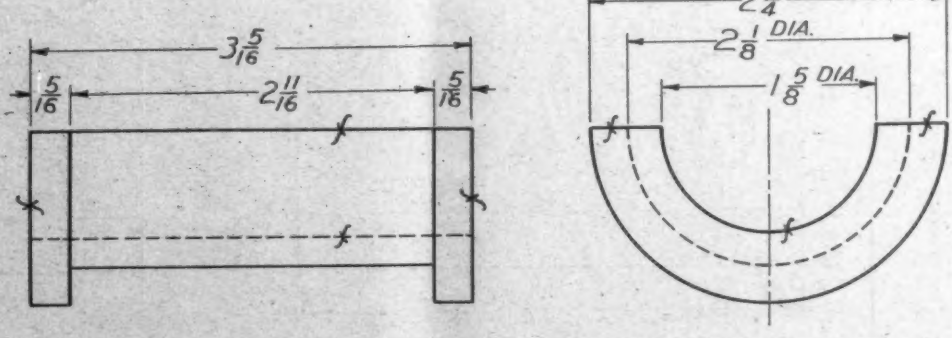
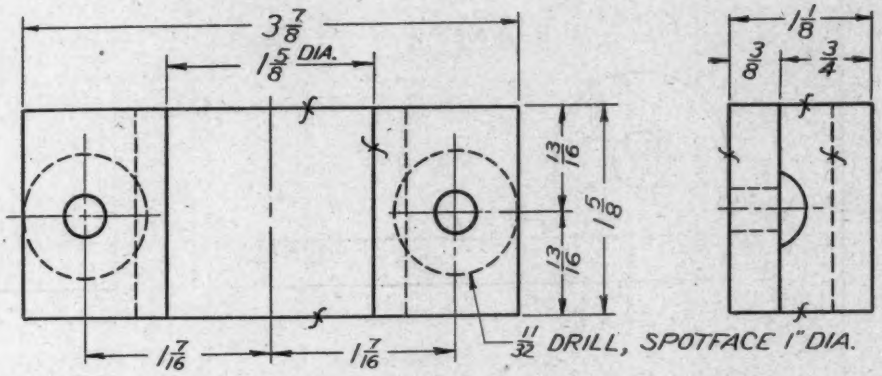
Job 26. Draw a top view of the lower bearing.
Purpose: To teach the reading of a top view.



Your Name Date Completed

Fundamentals of blueprint reading. C. H. Niemann, Oliver Morton High School, Hammond, Ind.

Job 29. Draw a top view of the bearing cap.
Purpose: To teach the reading of a top view.



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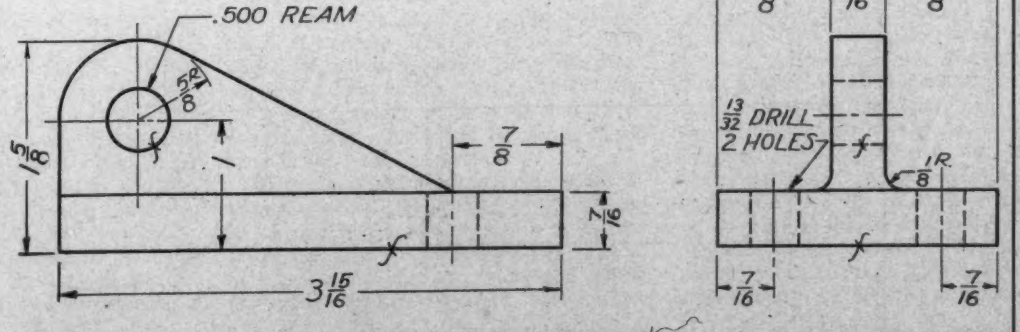
Job 28. Draw a top view of the shaft support
Purpose: To teach the reading of a top view.



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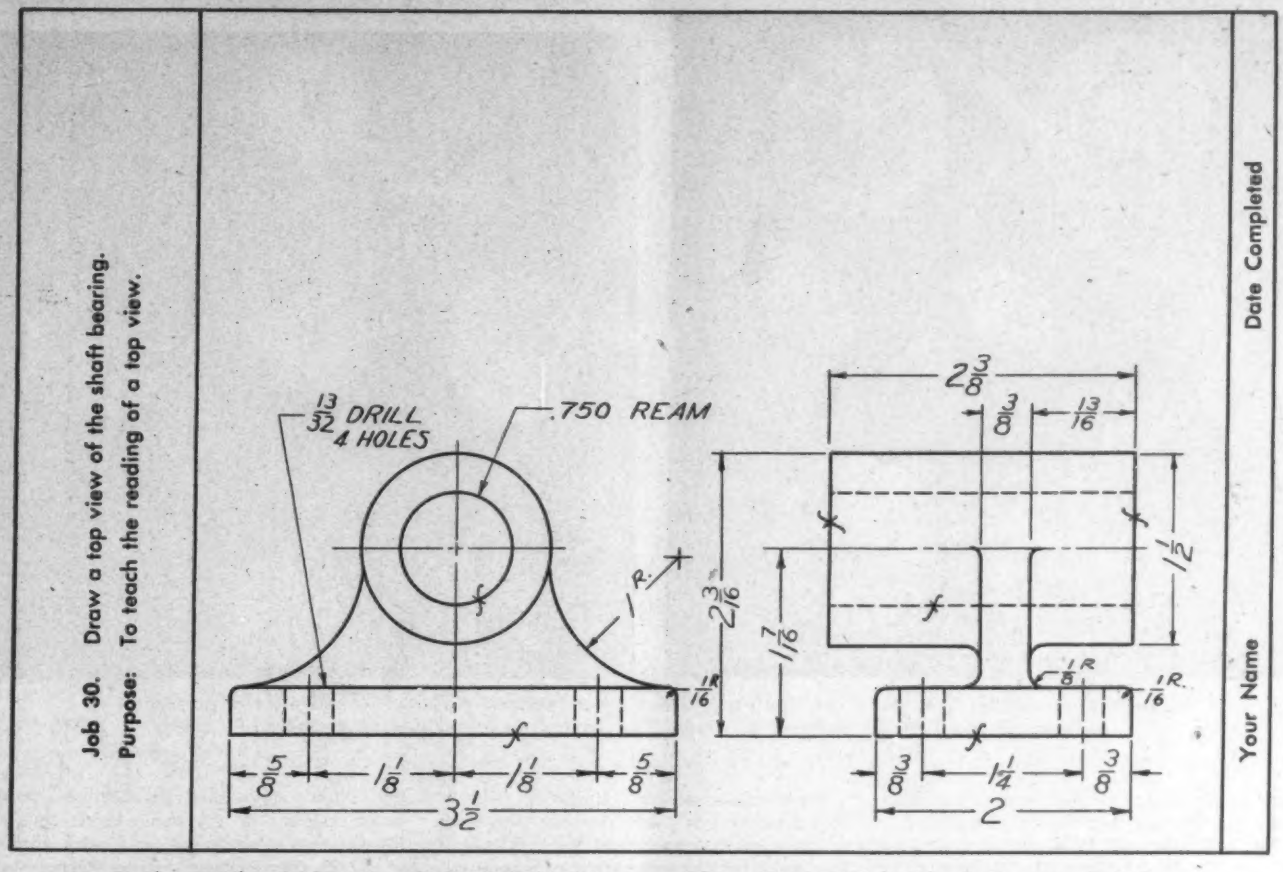

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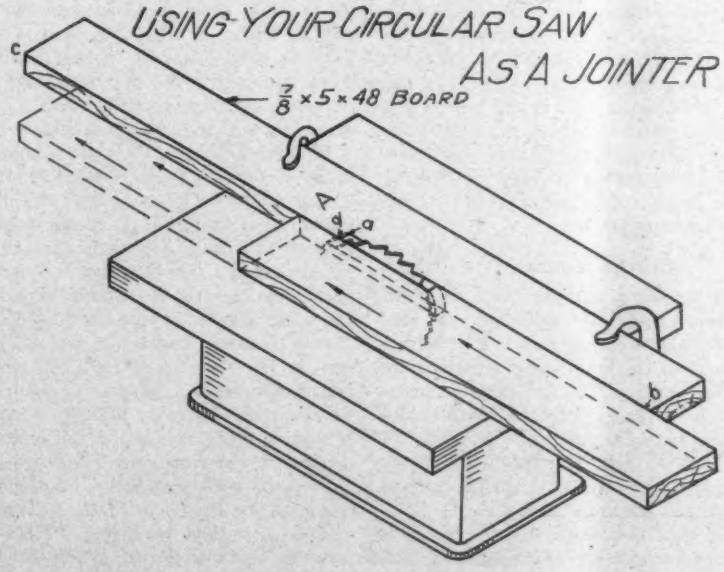
USING THE CIRCULAR SAW AS A JOINTER

O. R. BANNISTER
Givins School
Toronto, Ont., Can.

Pieces of wood may be jointed to a perfect edge to edge fit by using the circular saw.

1. Cut a straight grained board 7/8 by 5 by 48 in.
2. Run a saw cut down half the length of the left hand edge.
3. Thickness of saw cut d–a must equal the thickness of the saw.



4. Line c–d must be parallel to line a–b.
5. Clamp jointer fence board A to saw table so that lines c–d and a–b are parallel to the saw surface.
6. The edge to be jointed must be held firmly against jointer fence a–b, then as it travels past the saw, firmly held against edge c–d.

If these instructions are followed accurately, you may produce well-jointed edges which will fit together without planing.

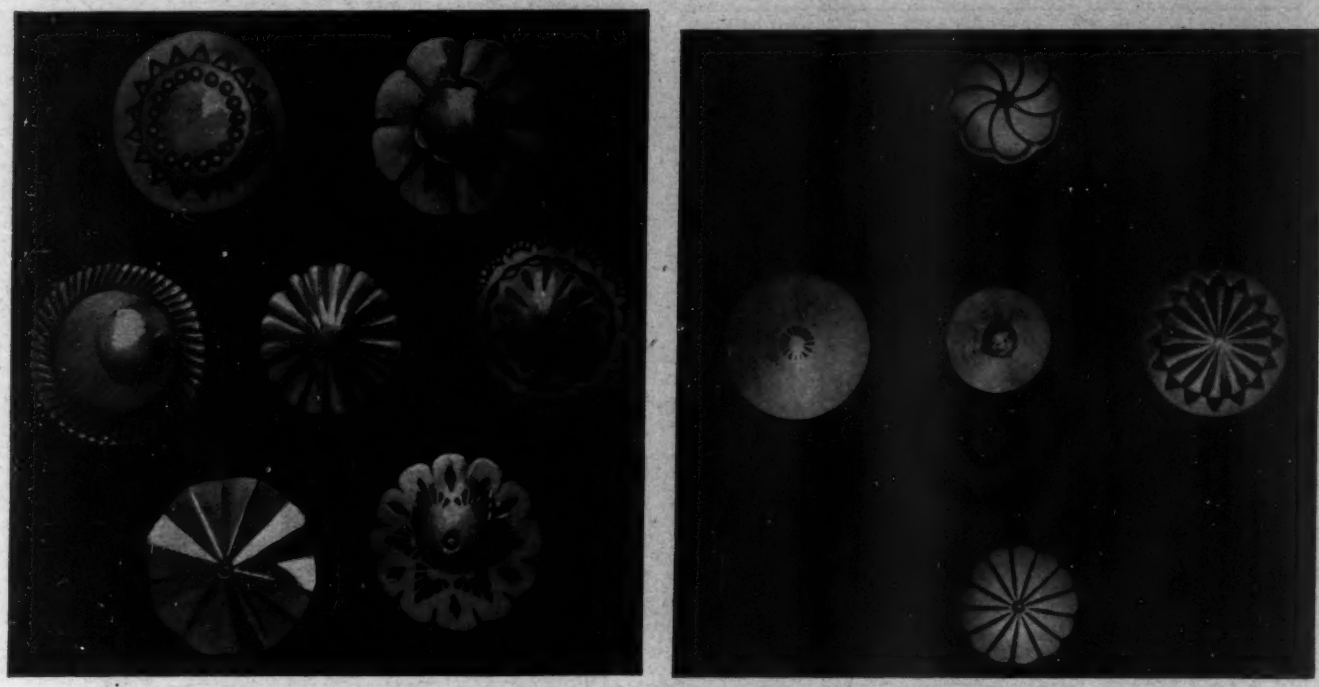
INDIAN SILVERSMITHING

BEN. HUNT

(Continued from page 169 of the April, 1947, issue)

Making Buttons

In addition to the tools required for silversmithing, the silver itself is necessary. The old-time Indian liked Mexican coin silver. Today it is rather difficult to obtain in quantities. However, coin silver in sheet form can be procured from some firms but since sterling silver is stocked wherever jeweler's supplies are sold, we need not be concerned with anything else. Pure silver is too soft for ordinary jewelry work. Sterling silver is an alloy of 925 parts pure silver and 75 parts copper, and is known as 925-1000 fine. Sterling silver comes in sheet and wire form. Sterling can be had in thickness 14, 16, 18, 20, 22, 24, and



Buttons made by Ben Hunt. At the right are shown modern Navajo buttons in old patterns. Pictures of the Navajo buttons, courtesy, The Taylor Museum, Colorado Springs, Colo.

26 Brown & Sharpe gauge, the smaller number being the thickest metal (and vice versa).

For ordinary work it is well to buy some 16-, 18-, and 20-gauge silver perhaps 6 in. wide by whatever length you see fit to purchase. The 6-in. width is suggested because that is the usual length for a bracelet, and that is about the longest piece of silver that will be used for making Indian jewelry. Twenty-gauge silver is just about 1/32 in. thick while 16-gauge is about 3/64 in. thick. A piece of 26-gauge silver should be bought for making bezels. Bezels are the little rims soldered to jewelry to hold turquois or other stones. B. & S. 26-gauge is about 1/64 in. thick. Silver is usually sold by weight but in ordering it, it is customary to state the gauge and the dimensions desired.

You will want silver wire also. This comes in thicknesses ranging from 14 to 30 B. & S. gauge. If you have a drawplate, the buying of wire is greatly simplified as one gauge of wire need only be on hand and the smaller sizes can be drawn as needed. In that case order only 14 or 16 B. & S. gauge wire.

With no drawplate on hand a few feet of 22 and 24 B. & S. gauge wire also will be needed.

It should be remembered that it is always easier to work with annealed silver. Silver wire usually comes annealed but it is sometimes necessary to anneal sheet silver. Hammering silver tends to harden it, and drawing wire through a drawplate also tends to harden it. For this reason wire is usually pulled through two holes and then coiled, heated, and immersed in cold water or a pickle solution before drawing it thinner or shaping it.

Three more items of equipment will be needed before you start. You will want stone or glass jars for water and the pickle bath. Two gallon stone crocks are ideal where only one or two persons are working, one for clean water, and one for the pickle. Then buy a small pyrex frying pan seven inches in diameter. This can be set up on a small electrical heating unit or on a gas flame whenever anything is to be heated. After work has been finished it is placed in this pyrex dish with enough pickle to cover it and by heating the pickle the silver becomes snow white. It is then taken out with a wood or copper tweezers, rinsed in clear water with a little baking soda added, and dried. It is then ready to be polished. Baking soda counteracts sulphuric acid, and as sulphuric acid is hard on the hands, a little baking soda in the rinse water helps to counteract the sulphuric acid of the pickle bath that is washed off of the silver. While it is not considered good practice to get one's hands in the rinse water, it frequently does happen.

Concha Buttons

Concha buttons are made in all sizes and with quite a variety of designs and with only one simple soldering operation, that of soldering the loop to the back. Concha buttons are often small replicas of the larger conchas made for belts. Sizes, of course, are governed by the use they are put to, so although the drawings are all about 1 in., the buttons may be made smaller or larger to suit the purpose for which they are to be used.

Do not use a compass to inscribe the circle as it leaves a telltale center mark which spoils the button's appearance. Instead, use a cardboard template or any round object such as a coin or another button, and mark around it onto the silver. Twenty-gauge silver is ideal for buttons. After laying out the desired number of disks on a piece of silver, cut them out. You can use a small tin snips or a jeweler's saw for this. The tin snips is a whole lot quicker. True up the edges of the disks with a file as shown at Figure 1, Plate 5. For a starter, we will make button No. 1, Plate 6. Lay on a smaller circle and quarter the outer area. Then bisect the quarters. Take a small moon-shaped die and stamp around the smaller circle and between the radial lines as shown in Figure 2, Plate 5. Notice how the third finger of the left hand holds down the disk. These first stampings should be done on the anvil. Now with a straight die stamp the radial lines. See Figure 3, Plate 5. If the disk twists slightly out of shape, turn it face down on a block of wood and hammer it flat again. File the pedals with a small triangular or square file, as shown in Figure 4, Plate 5. It is well to hold the disk as shown, rather than in a vise, thus avoiding vise marks, and, then too, the work can be held over the filing drawer to save all the filings. The disk is then laid face up on a block of wood and the lines hammered down still more. The pedals now begin to assume a rounded shape as shown in Figure 5, Plate 5. Next, make a shallow depression in the end grain of the wood with a round stamp. Then turn the disk face down and bump down the center part slightly. See Figure 6, Plate 5. Then shape the pedals as shown in Figure 7, Plate 5. Note how the block is shaped. When the disk has

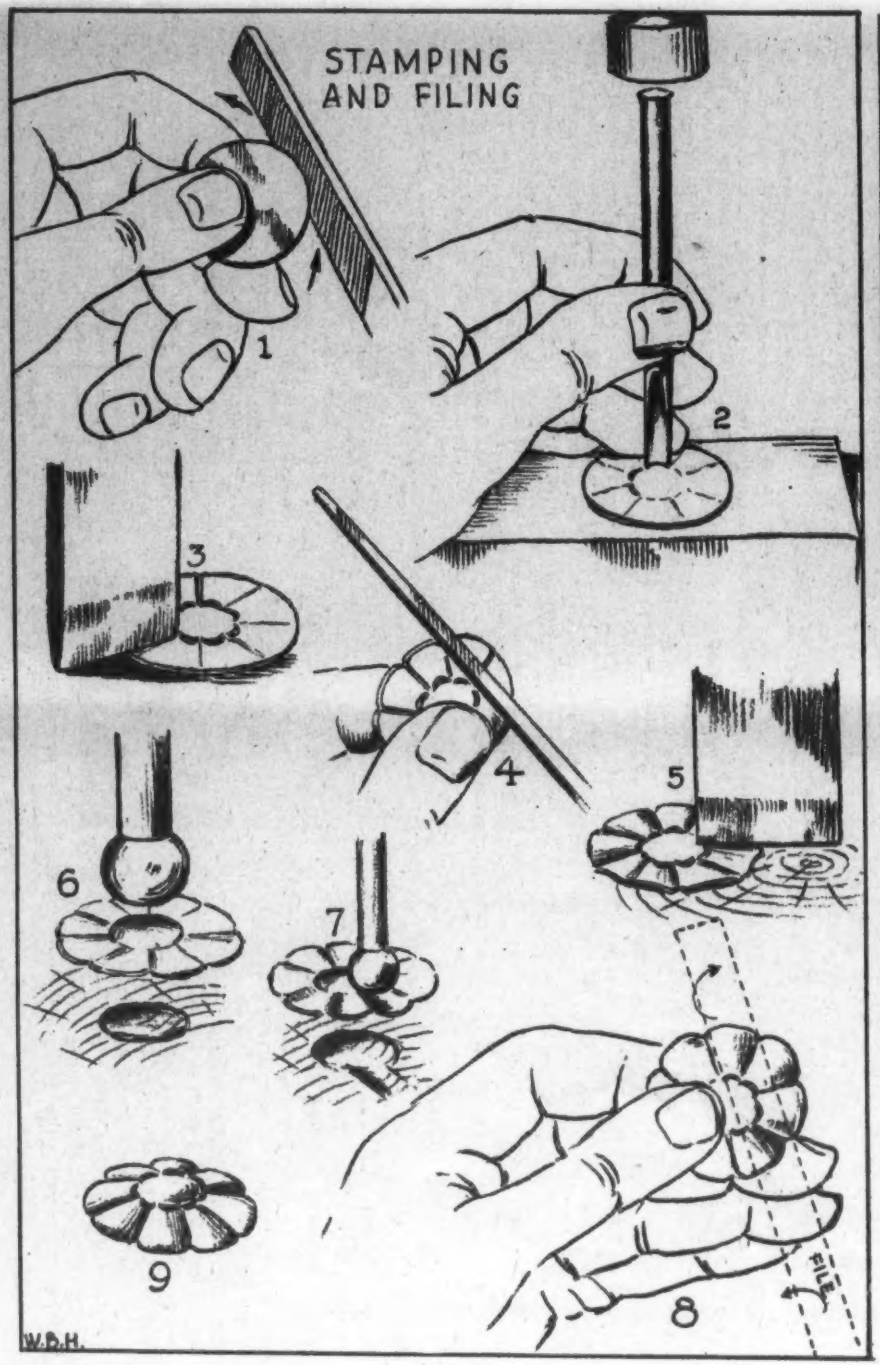


Plate 5

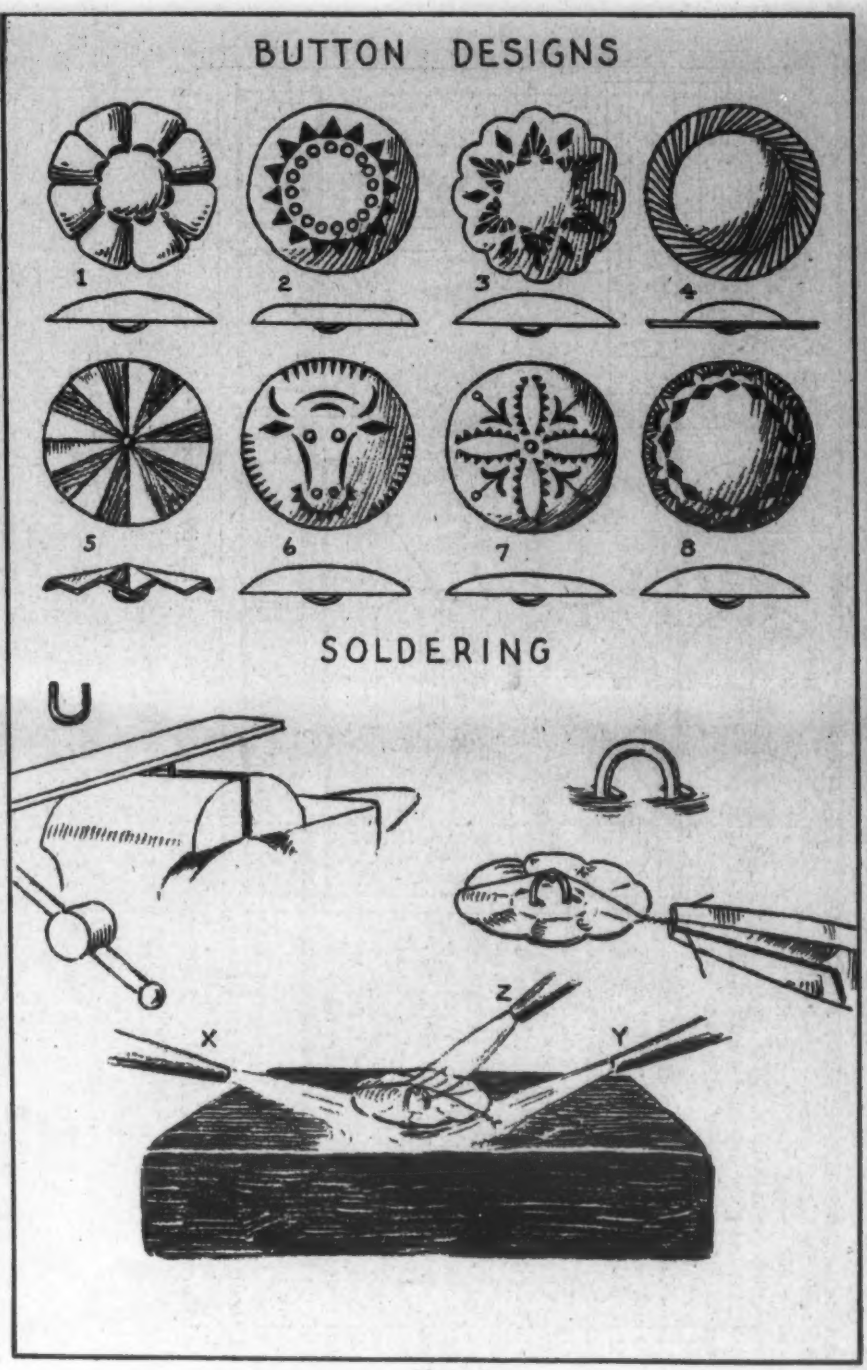


Plate 6

taken on the shape shown in Figure 9, Plate 5, it is ready for filing. Figure 8, Plate 5 shows how the file is used. This takes care of all irregularities due to hammering. The finer your file is, the less polishing you will have to do later on. Finish up with crocus cloth to take out most of the file marks.

Before polishing, the loop is soldered to the back of the button. Bend a small *U* shape, cut it off and file the ends square. See Plate 6. Sometimes these loops can simply be set in place and soldered, but as a rule they will have to be held in some way. The best way is to wire it in place, using thin black annealed iron wire. The place where the loop is to be attached should be scraped or sanded clean, the loop wired in position, and flux and two small snippets of solder placed at the two ends. Place the button on a charcoal block and slowly apply the heat, heating evenly, below and above as shown at x, y, and z, Plate 6, until the solder flows. Then you are ready to polish the button. Loops must be high enough to allow a needle to pass through.

Figure 2, Plate 6, shows a button that is made with a triangular stamp and a small nail set. The edges of the disk are rounded from the back on a block of wood. Figure 3, Plate 6, is stamped and domed in a large dapping block depression or on a wood block. Figure 4, Plate 6, has a large circle outlined with a suitable die, and the edge design is made with a small straight die. The center only is domed. Figure 5, Plate 6, is made entirely with the wide straight die shown in Figure 3, Plate 5, with a small nail-set mark for a center. Stamp from the front first on the anvil. Then turn it over and stamp the back, also on the anvil. Then use the wood block, hammering first from the back and then from the front with the same large die. Figure 6, Plate 6, is punched with different dies, as is also the case with Figures 7 and 8. The doming is done after the designs are punched.

After doming, take a clean flat file and go over the entire surface, holding the disks as in Figure 8, Plate 5. This produces an even surface. It also takes down the small ridges of silver that the die punches press up around each stamping.

After the filing is done, solder on the loop and polish the button.

NAIL HOLDER

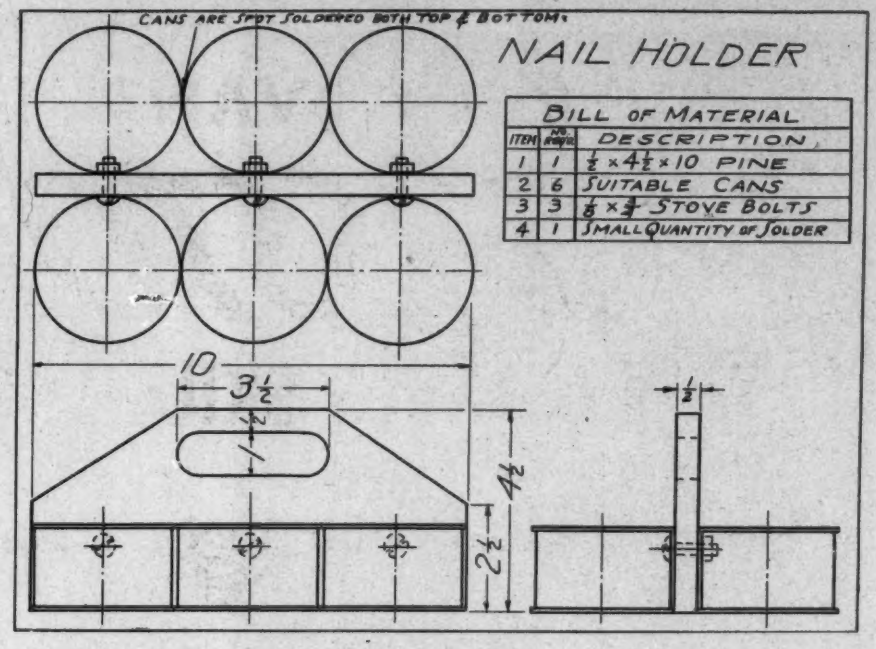
DAVID JOHNSON

Hosford School
Portland, Ore.

This convenient and very useful container for nails, screws, and other small parts requires very little material. The material may be obtained almost anywhere. Only one piece of pine lumber ½ by 4½ by 10 in. is required. Six salmon, tuna fish, or other suitable size cans may be used. These cans may usually be secured from the school cafeteria.

The size of the handle may be varied to suit the size of the cans used. Hinged covers for the cans are not shown and are optional.

Holes are punched in the cans near the top with a nail that has been cut off square — one hole in each can near the top. Stove bolts are used to hold cans to the handle. Soft rivets may be used but some difficulty is encountered in riveting. The cans are spot soldered together, near the top and bottom as indicated on the drawing.



Handy nail holder

Personal News

PAUL NELSON DIES

Paul C. Nelson, professor of industrial education at The Stout Institute, Menomonie, Wis., died suddenly on Sunday morning, March 13, 1947, after an illness of a few days.

A teacher at Stout since 1926, Mr. Nelson came to America in 1912 from his birthplace, Thisted, Denmark. Settling first in Racine, he followed the carpentry trade and became foreman of the cabinet-making department in a Racine factory. His skill in carpentry and woodwork led to his appointment in 1915 as instructor in the Racine Vocational School where he remained until coming to Stout.

P. C. Nelson

Mr. Nelson is regarded as having been a pioneer in developing the visual education department of the college.

Always willing to do his part in community affairs, Mr. Nelson even during the months immediately preceding his death attended public gatherings at which his visual aid material assisted those planning community programs. He was an ardent sportsman and delighted in constructing boats for use on the lakes and streams of the northwest.

From his shops and classrooms have gone generations of industrial-arts teachers equipped with the technical skill which he taught them and imbued with the spirit of manliness which was his. It is in the successful careers of the Stout Institute graduates that Mr. Nelson's true memorial may be found.

♦ Dr. Fred J. Schmidt has been appointed professor and head of the department of industrial arts at Ball State Teachers College, Muncie, Ind., to succeed Prof. Orville E. Sink. Prof. Sink, who will retire at the close of the summer term, will end a teaching career of 41 years.

Dr. Schmidt came to Ball State in 1935 and has taught in the college and in the laboratory school since that time. Author of several articles and publications, Dr. Schmidt received his Ed.D. degree from Indiana University, his A.B. from Iowa State Teachers College, and his A.M. from the University of Wisconsin. He has served as president of both the Iowa and Indiana Industrial Education Association.

♦ Branch Office No. 9 of the Veterans Administration at St. Louis, Mo., is manned by the following personnel:

Herbert H. Scott, chief of education and training, and formerly director of extension at the University of Oklahoma.

Hugh P. Harshbarger, assistant chief of education and training, who was formerly director of industrial arts at the Maine Township High School, Des Plaines, Ill. During the war years he had charge of the war-production training program conducted through the school at the Douglass aircraft factory.

Special supervisors are:

Forest E. Moore, supervisor of professional

(Continued on page 20A)

TAKE ADVANTAGE OF DISSTON SAW MAKING SKILL AND SERVICE

Have your saws refitted by Disston Saw Experts in the Disston Plant

Disston provides a special saw-refitting service that will enable you to keep your hand saws, band saws, and circular saws in top condition and add considerably to their life.

The refitting is done by Disston saw experts using the finest of modern equipment. Each refitted saw is carefully tested for accuracy of set; tension; evenness of tooth edge; and sharpness.

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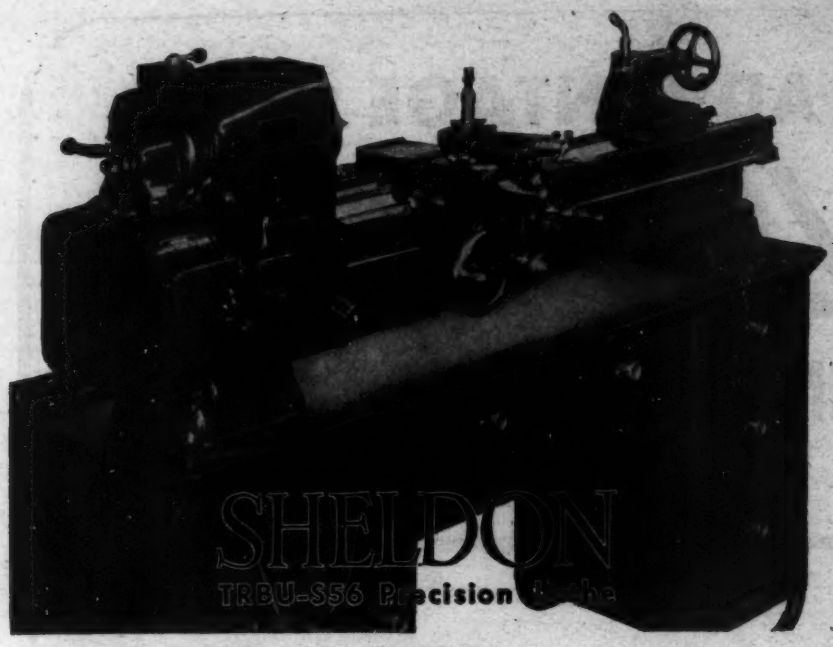

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The new 1947 model, Sheldon TRBU-S56 lathe is the last word in school lathes. Its completely enclosed, 1 h.p. motor drive has 2 V-belts to the spindle. Delivers full power at the point of work. It has "Zero Precision" Timken tapered roller bearings. It is safer, for all belts, gears and pulleys are enclosed—all speed changes are made with convenient outside levers.

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(Continued from page 226)

and scientific fields, formerly state director of vocational education for the state of Iowa, and later consultant at the U. S. Office of Education, Washington, D. C.

CLARK L. JACKSON, supervisor of trades and industries, and formerly head of the industrial education department, State Teachers College, Emporia, Kans.

T. W. WAUCHOPE, supervisor of business and sales, who was formerly principal of the Oklahoma School of Accounting, Law and Finance, at Tulsa, Okla.

PAUL B. KINDER, supervisor of agricultural occupations, formerly district supervisor of the Farm Security Administration in the state of Missouri.

WILLIAM A. MILLER, supervisor of special rehabilitation procedures for the severely handicapped. He spent three years in a Japanese prison camp and is himself a blinded veteran who received special training at Avon, Conn., and at Washington, D. C.

♦ JOHN M. BROPHY, Jr., has been named assistant professor in the New York state school of industrial and labor relations at Cornell University, Ithaca, N. Y.

He was formerly a faculty member at The Stout Institute, Menomonie, Wis., and later was appointed assistant supervisor of war-production training for the Wisconsin state board of vocational and adult education, Madison, Wis.

♦ RAYMOND SCOTT, formerly industrial-arts instructor in Lapeer and Lansing, Mich., has joined the faculty of the department of aeronautical engineering at the University of Michigan, Ann Arbor, Mich.

♦ A. A. VEZZANI has again joined the staff of the department of vocational education, University of Michigan, Ann Arbor, Mich.

♦ CECIL BARNES has been appointed industrial-arts teacher at Verona School, Battle Creek, Mich.

♦ RUDOLPH GENETTI is the instructor of woodworking at Southwestern Junior High School, Battle Creek, Mich.

♦ MARION CANADY has been made instructor of auto-mechanics at Central High School, Battle Creek, Mich.

♦ PARKER M. GREEN of Ohio State University, has accepted a position as head of the industrial-arts department at Kansas State Teachers College, Emporia, Kans., it was announced recently by President David L. MacFarlane. Mr. Green will fill the vacancy created by the resignation of Clark L. Jackson, who is now with the Veterans Administration in St. Louis.

♦ KAUKS A. WAHTERA is head of the industrial-arts department at Lakeview Senior High School, Battle Creek, Mich.

♦ HOWARD N. KUSCHE is instructor of woodwork and drafting at Park Junior High School, Oshkosh, Wis.

♦ GEO. H. RICHARDS teaches metalwork at Eastern Junior High School at Louisville, Ky.

♦ M. E. ASPENSON is instructor of auto mechanics at the high school, Mason City, Iowa.

♦ IRVIN J. LATHROP teaches industrial arts in the public school system of Platteville, Wis.

♦ GEORGE BAZIK is teacher of the general metal course at the Grossmont Union High School, Grossmont, Calif.

♦ N. ORWIN RUSH has been appointed executive secretary of the American Library Association.

He is a native of Oklahoma, and received his B.S. and M.S. degrees from the Columbia University School of Library Service in 1932 and 1940 respectively.

His office will be at the headquarters of the association, 502 North Michigan Ave., Chicago 11, Ill.

♦ HOMER T. RAGLE, Springfield, Mo., died as a result of a heart attack on January 26, 1947.

He served as assistant state supervisor of industrial education from February, 1944, to June, 1946. He was then appointed director of vocational education in Springfield, Mo.

♦ CARL M. HUMPHREY, formerly instructor of vocational agriculture at Odessa, Mo., has been appointed district supervisor of agricultural education of northeast Missouri.

♦ DR. MARVIN SHAMBERGER, superintendent at Bowling Green, Mo., has been appointed head of the research division of the Missouri State Teachers Association at Columbia, Mo.

♦ LELAND A. BENZ, co-ordinator of trades industrial education, Oskaloosa, Iowa, resigned his position to accept a position as instructor of general metals in the vocational department of Maine Twp. High School of Des Plaines and Park Ridge, Ill.

♦ GEORGE KOHRMAN, director of industrial education, Missouri State Department of Education, will be guest professor at Missouri University for this summer session of 1947.

♦ DOYLE KEMPER, state supervisor of industrial arts in Missouri, will conduct courses in industrial-arts subjects at the A. and M. College of Texas, College Station, Tex., during the first summer session of 1947.

♦ W. J. DUNNING, is director of industrial arts at State Teachers College, Ellendale, N. Dak.

♦ EARL MARTHART is teaching industrial-arts work at Jefferson Junior High School in Dubuque, Iowa.

♦ EDGAR A. JENKINS is teaching printing at Riverside Township High School, Riverside, Ill.

♦ MILTON MUELER is teaching engineering drawing at Burlington High School and Junior College, Burlington, Iowa.

♦ ALBERT JORDAN, formerly head of the auto-mechanics department at Hadley Technical High School, St. Louis, Mo., has been appointed assistant principal of that school.

♦ NORMAN CROUCH, co-ordinator of diversified occupations at the high school, Warrensburg, Mo., has been appointed assistant director of veteran

(Continued on page 22A)

TEACH *your* Classes on Industry's Own Tools

PORTER-CABLE

Prepares the Student for an Important Job in:

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- POWER HANDSAWING
- ABRASIVE BELT MACHINING
- FLOOR CONDITIONING

Effective vocational training must prepare the student to use the tools of industry! Porter-Cable Belt-Surfacers — Wet or Dry, Speedmatic Saws, Speedmatic Floor Sanders, Take-About Dustless Sanders — these are the tools that dominate their fields! Experience on industry's own machines is a quick passport to a good job for the students who will look to you for guidance. Modern vocational training is serious business, and deserves the machines of business. If you would like to know more about Porter-Cable Tools, we'll send you the literature we send to industry — to enable you to start the pupil right!

• YOUR BOARD WILL BE GLAD TO KNOW. Your school board will be glad to know that these tools can be put to productive use in your own shops! For maintenance work of all kinds — to finish desks or blackboards — to sand floors — to fit sash and doors — or to help out on light construction work — these Porter-Cable Tools are industry's own! Your Board will be quick to see the double value of training equipment that's also unexcelled for maintenance. ASK FOR LITERATURE — THE SAME WE SEND TO INDUSTRY!

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CN-2 ABRASIVE BELT GRINDER

The CN-2 increases output over ordinary bench grinder by 200%. Eliminates wheel loading, wheel digging, wheel dressing. Grinds on contact wheel, platen or free belt. Shops everywhere use the CN-2 for deburring, bevelling, chamfering, knocking off corners, clean-up. Your student will have a better chance for a job with abrasive belt grinding experience.

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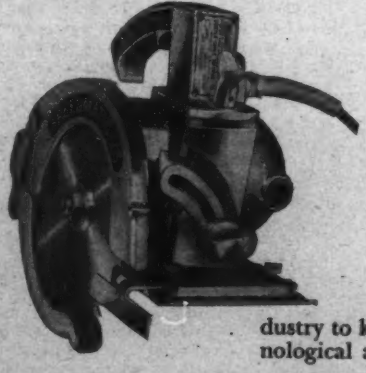

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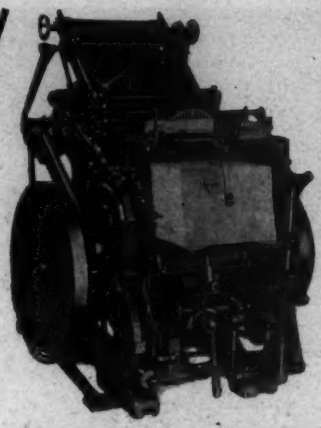

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10x15	Maximum Sheet	11x15½
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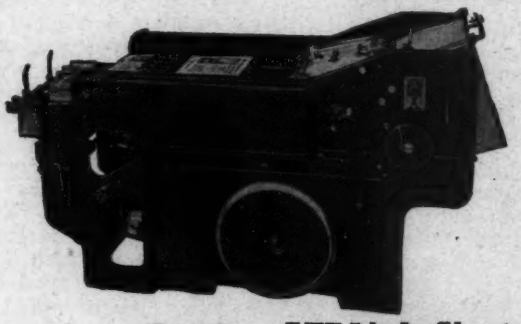
	Minimum Sheet	1⅞x4½



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Department of Education 200 Elmora Avenue, Elizabeth 8, N. J.

(Continued from page 20A)

education in the Missouri state department of education.

♦ VINCENT P. CONNERS, formerly shop instructor at the William E. Russell School, Dorchester, Mass., is now at Boston Teachers' College, Boston, Mass., and has been assigned to the job of improving handwork in the special class department of the city schools.

♦ E. J. HARRISON is head of the industrial-arts department of the Pana Township High School, Pana, Ill.

♦ WM. S. HARDY is instructor of industrial arts at Douglass High School, Webster Groves, Mo.

♦ F. S. ORR is instructor of industrial arts at the Junior High School at Iowa City, Iowa.

♦ VINCENT H. SAUNDERS is teaching woodwork in the school system at Huntington Beach, Calif.

♦ VERN F. NORDEEN is teaching at Washington Irving Junior High School in Des Moines, Iowa.

♦ C. V. RODERICK, formerly district supervisor of agricultural education, has been made assistant professor of agricultural education at the University of Missouri, Columbia, Mo.

♦ J. B. RUTLEDGE, formerly instructor of vocational agriculture at Steele, Mo., has been appointed state supervisor of veterans education for Missouri.

♦ J. C. BUCHANAN, Jr., Waverly, Tenn., JAMES H. MEACHEN, Ellendale, N. C., and ELMER F. STAPHER, Morristown, Minn., received M.S. degrees at the close of the fall quarter, at Iowa State College, Ames, Iowa.

The three men are now employed as field supervisors of veteran training for Iowa, by the Veterans Administration.

♦ JOHN BLEVANS has been appointed instructor of photography at the Trade School, Topeka, Kans.

♦ J. D. WILLIAMS has received an appointment as auto-mechanics instructor at Argentine High School, Kansas City, Kans. He has operated his own auto-mechanics shop, and served in the U. S. Army as an auto mechanic for three years.

♦ J. R. BORDERS has been appointed carpentry instructor in the day trade program at Sumner High School in Kansas City, Kans. He has had thirty years of practical experience in the building trades.

♦ JAMES STUDEBAKER, who has eleven years of experience as an industrial welder, and several years of experience as a welding instructor in the army air corps civilian mechanics training program, has received appointment as instructor of acetylene and arc welding at the Trade School, Topeka, Kans.

♦ EARL H. BROWN, formerly instructor of industrial arts, Missouri Military Academy, Mexico, is now instructor of electricity in the Lead Belt Trade School, Bonne Terre, Mo. This school is a new area trade school serving 11 co-operative districts. It offers instruction in welding, machine shop, sheet-metal work, auto mechanics, and electricity. Plans are being made to add courses in the building trades.

♦ GLENN DUNCAN has returned to his position as instructor of industrial arts in the University of Missouri high school. He served as a lieutenant in the navy during the war. Since being discharged in January, he has worked part time in the adult education service of the University and has taken graduate work leading toward the doctor's degree in industrial education.

♦ ELMER LAURENCE is in charge of the new automobile drivers' course for seniors at Nott Terrace and Mont Pleasant, Schenectady, N. Y.

♦ GUY FOSTER has been appointed acting head of the combined industrial-arts and vocational programs at Nott Terrace, Schenectady, N. Y.

♦ RAY DIVER taught machine design in the Troy State Veteran School, Troy, N. Y., this summer.

♦ JAMES MACCRACKEN retired October 1, after 30 years of service in the Schenectady Schools, Schenectady, N. Y. He will be missed at the Vocational High School where he taught science and mathematics for 12 years.

♦ JUDSON STEWART was principal of the 8-weeks' G.I. institute at East Technical High School, Cleveland, Ohio. Members of his staff were JOHN KLUG, PAUL SCHERER, and CLARENCE LOEFFEN.

♦ LEONARD G. MORSE, state director of agricultural occupations for the Veterans Administration in Michigan, has been named Midwest area supervisor.

♦ JULIUS BARBOUR, formerly principal of Stillwell Junior High School at Alma, Mich., has been appointed co-ordinator and instructor of building maintenance classes at Michigan State College, East Lansing, Mich.

♦ JOS. E. THOMPSON has resigned as supervisor of trade and industrial education in Illinois. He has served his state for over 40 years. Sixteen of these have been spent as a member of the state board for vocational education.

♦ DR. LAWRENCE L. JARVIE has been appointed associate commissioner of education for New York. He will have charge of the organization of the five new institutes of applied arts and sciences authorized by the 1946 legislature. He will also supervise the six existing state agricultural and technical institutes, and be responsible for the program of adult and veterans' education.

♦ PAUL B. RICHARDSON, state supervisor of distributive education for New York, has been appointed director of the newly created Institute of Applied Arts and Science at Unica. The institute will offer retail store business management, mechanical, and electrical courses.

♦ Z. M. STRONG, industrial-arts teacher at Hickman High School, Columbia, Mo., for the past several years, died suddenly a short while ago.

♦ R. A. FORBES, a graduate of Northwest State College, Maryville, Mo., was appointed instructor of industrial arts at the Hickman High School, Columbia, Mo., to take the place of Z. M. STRONG, who died recently.

♦ A. B. BLACKLOCK has been appointed itiner-

(Continued on page 25A)

FAVORITE OF THE FURNITURE FACTORIES

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AND BEST FOR SCHOOLS TOO!

HERE'S WHY

The ancient Egyptians relied on animal glue. Examples of their wood craftsmanship are on exhibition today in Cairo, age-old proof animal glue is strongest, holds the longest.

With Franklin you can do away with messy glue pots, for Franklin is used right from the can—AS IS! No unpleasant odor.

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T-SQUARES — STRAIGHTEDGES — COMPASS — DIVIDER — PARALLEL RULERS — ROLL PAPER DISPENSERS
STEEL TOOL TRAY — STEEL TOOL DRAWER — CARRYING CASE for PROFESSIONAL DRAWING KIT!

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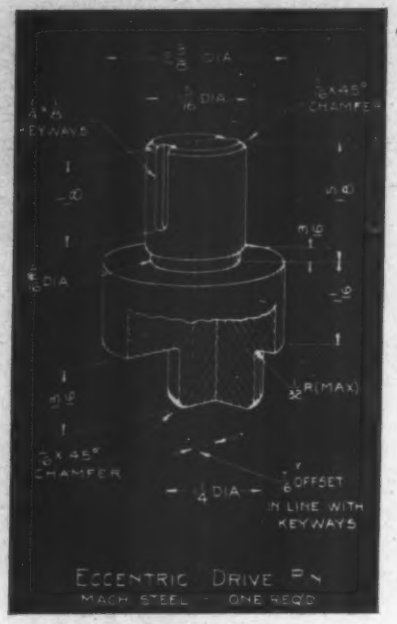

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(Continued from page 22A)

ant instructor of safety and on-the-job training for co-operative students being trained as groundmen and linemen. His headquarters are at Fulton, Mo., and he will have charge of this type of training for the north half of the State of Missouri.

♦ IVAN K. BOGGS has been appointed itinerant instructor for the southern half of the state of Missouri in charge of safety and on-the-job training for co-operative students being trained as groundmen and linemen. His headquarters are at Lebanon, Mo.

♦ WILLARD THORPE has been made instructor-co-ordinator of distributive education, Topeka High School, Topeka, Kans.

♦ MILTON W. KARSTADT has been appointed instructor-co-ordinator, Office Practice and Distributive Education, at the high school, Coffeyville, Kans.

♦ EVERETT W. FULLER has been made instructor-co-ordinator, distributive education, at Pratt Junior College and High School, Pratt, Kans.

♦ CLYDE F. EVANS received an appointment as instructor-co-ordinator of distributive education at Independence, Kans.

♦ LT. (jg) MARVIN POYZER has joined the faculty of the University of North Dakota as assistant professor in education, and head of the department of industrial arts.

He is a native of North Dakota, entered the University of North Dakota under Elroy Bollinger, head of the department of industrial arts in 1934, and received his B.S. in education degree in 1938. Studies toward M.A. were made under Perry and Baab at C.S.C.E. in 1940-41. He taught industrial arts at Worthington and Robbinsdale, Minn., from 1938 to 1942. He attended the Navy Teacher Training Center at 87th and Anthony in Chicago, and supervised training in that center until November, 1942, when he enlisted in the navy. Several assignments in teacher supervision and training, in A.M.M. and A.E.M. schools followed commissioning in 1943. He served as first lieutenant aboard Admiral Kinkaid's flagship, the U.S.S. Rocky Mount in the China theater.

News Notes

♦ The United States Testing Co., Inc., has revised its booklet, "Testing Terms for Better Understanding." This is a new printing of the booklet, dedicated to better understanding of some of the important tests of merchandise — how tests are made, what are standard minimum specifications.

The new booklet includes a description of the abrasion test, with standards on various types of fabrics, description of aging, air permeability and animal injection tests among others. Flexural strength is defined and a detailed description of hosiery analyses is given. Standard textile regains for all textile fibers is listed. The seam slippage test is described. The warmth tester, as developed by the United States Testing Co. Inc., is included, together with minimum serviceability standards and warmth coefficient for blankets.

Get a free copy by writing to the United States Testing Co. Inc., at Hoboken, N. J.

♦ The Princeton Film Center, Princeton, N. J., recently released a new 16mm. sound film in color, entitled "The Phantom." The film has as its subject the new twin jet propelled navy fighter from which its title is derived. The new picture is nontechnical. It is the first film of its kind in the history of jet propulsion. It has a running time of 20 minutes. Inquiry concerning use of the film should be made directly to the distributor at Princeton, N. J.

♦ Dr. John W. Gates, new principal of the East High School of Aurora, Ill., has secured a grant from the Federal Works Agency of the Federal Government for the erection of a temporary building, 114 by 25 ft., for the purpose of establishing a machinists' trade course for veterans in Aurora and vicinity. When not in use for veterans' courses, the building may be used for classes for high school pupils. Equipment has also been secured through the government and the state vocational department. This reconstructed dining hall from Camp Grant should be ready by September 1.

♦ The school service division of the Westinghouse Electric Corporation, 306 Fourth Ave., Pittsburgh 30, Pa., offers the following charts, motion pictures, posters, and transcriptions for school use:

The Electron Tube, 25 by 36 wall chart;

Electronics at Work, a transcription kit of three 16-in. 33 1/3 r.p.m. transcriptions containing six 15-min. programs on (1) the electron, (2) the electron tube, (3) electronics in communication, (4) electronics in transportation, (5) electronics in industry, and (6) electronics in health and personal enjoyment. Available only as kits.

The Steam Turbine and Condenser, 28¾ by 40 wall chart;

The Waterwheel Generator, 25 by 36 wall chart;

Everyday Electricity, series of nine 25 by 30 wall charts;

The Entire Electromagnetic Spectrum Chart, 40 by 30 wall chart;

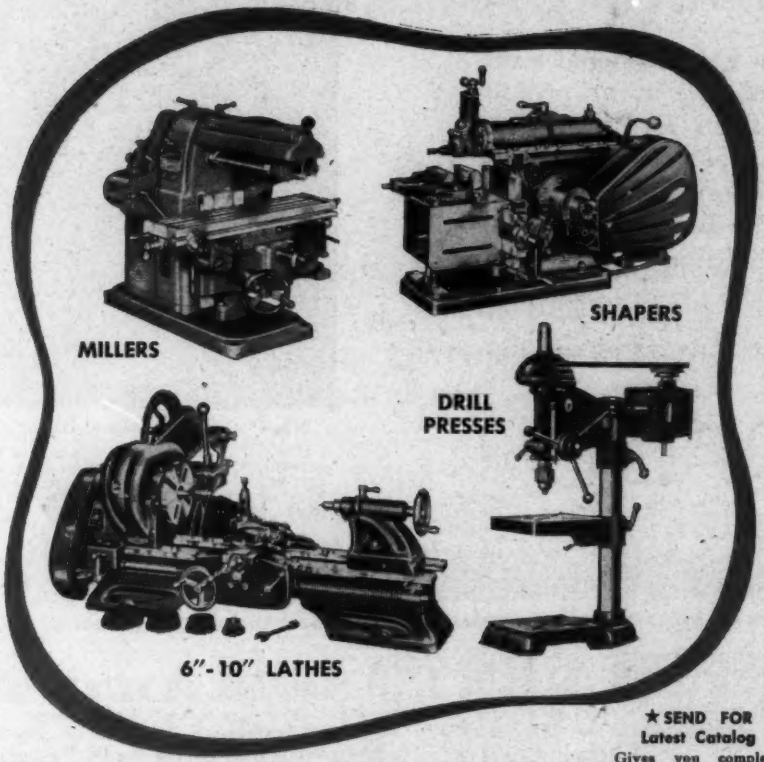
Biggest and Littlest Things, 24 by 37 wall chart;

Pictorial Bulletins, 14 by 17, two color posters. Useful for bulletin board displays. Mailed once a month.

Adventures in Research, 16mm. and 35mm., black and white, sound motion picture. Running time, 20 min.

(Continued on next page)

Step Up STUDENT INITIATIVE WITH NEW ATLAS TOOLS



Giving your students full opportunity to acquire practical skills on more and varied projects is an ideal way to stimulate initiative and class morale. Interest is keener — basic principles are easier to master and remember — when they can follow through with ample machine time. Compact Atlas tools give you the greatest possible number of pupil stations in your available floor space — at lowest cost. Ask your Atlas distributor for complete performance and construction details. Orders placed now can be delivered in time for the Fall term.

★ SEND FOR Latest Catalog

Gives you complete information about the Atlas 4-Tool Team and low cost accessories. Sent with bulletin of school equipment recommendations.

ATLAS PRESS COMPANY
571 N. PITCHER ST. KALAMAZOO 13, MICH.

(Continued from previous page)

Twenty-page index of Westinghouse Educational sound-motion films, and slide films.

♦ The school board at Somerville, Mass., has created a night vocational school, to be conducted for eight weeks, on Mondays and Wednesdays, from 7 to 10 p.m.

♦ The Childress county board of education at Childress, Tex., has established a vocational school for veterans and others who do not intend to attend college. The school offers three types of training: (1) agriculture, (2) distributive training, (3) trade and industrial training. The courses will cover 12½ hours per week and will run from ten to thirty months. Classes are conducted in regular classrooms and are under the direction of the county board of education.

♦ "Arc Welding at Lower Base Temperatures" is the title of a 4-page pamphlet, issued by the Eutectic Welding Alloys Corporation, 40 Worth St., New York 13, N. Y. The booklet gives essential information on the development, advantages, applications, and data for arc welding of all types of metals. It shows typical applications of "low-temp" eutectrodes for a variety of welding jobs. A copy of the pamphlet is available by writing to the firm at 40 Worth St., New York 13, N. Y.

♦ The American Stove Company, 4301 Perkins Ave., Cleveland 3, Ohio, is offering a new school range replacement program to the school home-economics departments. According to this program a new Magic Chef range, at the dealer's regular cost plus actual cost of installation, is offered to the school. Then a new range is furnished to the school, without cost, every two years thereafter, or as new models appear on the market. Such a program makes it possible for home-economics teachers to have the very latest in gas cooking equipment for the very minimum in cost. The plan is applicable only for instructional uses in home-economics departments of universities, colleges, senior and junior high schools.

A school folder, prepared by The American Stove Company, outlines the plan in detail and may be obtained by writing the advertising department in Cleveland.

♦ The story of rubber tire making — from raw material to finished product — is presented in a new Walt Disney technicolor film, "The Building of a Tire," which has just been released by The Firestone Tire and Rubber Company.

Available to schools, organizations, and other interested groups, copies of the film may be obtained from Association Films (formerly Y.M.C.A. Motion Picture Bureau) offices in Dallas, New York, Chicago, and San Francisco. The film requires 28 minutes running time. It is available only in 16mm.

Animated and live scenes depict sources and development of raw materials, and the complete assembly of the various parts on the tire building machines.

♦ The American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y., awarded an "Oscar" for the best school-made film, at its 1947 annual Audio-Visual Aids Institute held on Saturday, January 11. The award was given to "Emphasis on Science," written and produced by the Arista Film Committee of George Washington High School, New York City. Entries were received from numerous schools and the five best films were selected by a panel of judges to be voted on by the audience attending the Institute.

This contest is designed to arouse interest in motion picture making among the boys and girls of the nation's high schools. The contest will be an annual one and here are the conditions for entering the contest for 1948.

The competition is open to all students of junior and senior high schools in the United States. The films must be planned and produced entirely by pupils and must be 100 feet long or less. To enter the competition the faculty adviser of the group of student movie makers must secure an entry blank from the Museum, fill it in, and return it on or before May 15, 1947. The film must be sent to Dr. Grace F. Ramsey at the Museum by December 1, 1947. A selection of the winning film and the four next best films will be made by a panel of judges. All five films will be shown at the meeting of the Fourth Audio-Visual Aids Institute to be held at the Museum on January 9 and 10, 1948, accompanied by an explanation given by the judges as to why the one film was selected as the winner.

♦ Over 130 high school teachers, school administrators, and girl scout officials of nine Central Florida counties received instruction recently, in how to teach driving safety in two teacher training institutes held in Orlando and in Clearwater, Fla. The three-day institutes were conducted by the Orlando and Clearwater public school departments in co-operation with the National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Executives.

At the Orlando training sessions, 46 high school teachers and girl scout officials attended. The teachers reviewed the content and teaching methods of their school courses in driving and safety. The girl scout officials were preparing for roles as intructors in the current safe drive program of the girl scouting organization.

Forty-seven high school and junior high school teachers were among the 87 persons attending the institute at Clearwater. A number of high school students were also included in the classes so that they may better sell the idea of safe driving and safety education to their fellow students.

Harold R. Danford, director of the Education Division of the National Conservation Bureau, was in charge of the instruction at both institutes. Julian H. Harvey, managing director of the National Conservation Bureau, was

(Continued on page 28A)

IS IT PRACTICAL?
IS IT PRICED TO SCHOOL STANDARDS?

AVOID EXTRA HANDLING
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TO B-G

During the last five years many items have been hard to get, but that difficulty is rapidly disappearing. We urge you to go through the Brodhead-Garrett catalog and note items formerly unobtainable that will be scheduled in your projects for the coming year.

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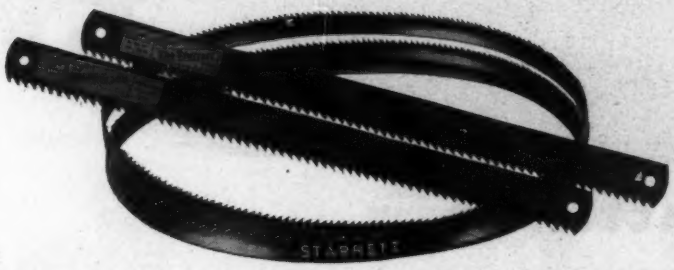
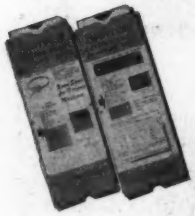
MEANS THE SAME QUALITY AND DEPENDABILITY ON

HACKSAWS AND BAND SAWS



Saws made by the "World's Greatest Toolmakers" can be counted upon to equal or exceed the performance of other brands. And the STARRETT line is truly complete — including hacksaws in all sizes and types for hand and power-metal cutting and band saws for cutting ferrous and non-ferrous metals, wood, plastics, fibre, composition, etc.



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World's Greatest Toolmakers

STARRETT TOOLS

Precision Tools • Dial Indicators • Steel Tapes • Ground Flat Stock
Hacksaws • Band Saws for Cutting Metal, Wood, Plastics

(Continued from page 26A)

present for a session of the Orlando Institute and spoke to the teachers on "The Layman's Point of View Regarding Driver Education."

Judson B. Walker, superintendent of Orange County Public Schools, was chairman of the teacher training institute at Orlando, and W. B. Feagle, principal of the Clearwater High School, and chairman of the Pinellas County Safety Committee, presided at Clearwater.

Three safety movies were shown and safety instruction apparatus was demonstrated by Mr. Danford at both institutes.

♦ All combat aircraft have been disposed of and planes still available to schools and other nonprofit institutions at nominal cost under the War Assets Administration's educational disposal program are limited to basic and advanced trainers and light transports. Plans call for the disposal of these by the end of March, and unless additional planes are made surplus by the military forces, this will virtually end the supply of aircraft available for educational disposal.

Schools also were advised by WAA to fill their requirements for aircraft parts and equipment as soon as possible, and at least by the end of the current school year.

♦ The Trade and Industrial Section of the Missouri State Department of Education in connection with the Rural Electrical Co-operatives of that state, are offering a safety and job-training program for beginning electrical workers.

♦ The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, will conduct four one-week courses in the first half of its 1947 school of spray painting for industrial finishers. These courses were scheduled to start January 13, March 10, May 12, and June 23, each covering the same classroom instruction and shop work.

Courses are given without charge to users of DeVilbiss spray equipment. All interested should write for reservations well in advance.

♦ Case School of Applied Science will offer 50 fellowships to high school teachers of physics for a six-weeks' program of study during the summer of 1947.

Recognizing the fact that industrial research and progress stem largely from a knowledge of physics, the General Electric Company has provided these fellowships for high school and preparatory school teachers of physics. The program is designed to acquaint teachers with recent scientific developments.

The General Electric Science Fellowships for Teachers include all tuition fees, room and board, and travel expenses. High school and preparatory school teachers of physics from the following states are eligible to apply: Ohio, Michigan, western Pennsylvania, West Virginia, Kentucky, Indiana, Illinois, Wisconsin, and Maryland.

For further information write to ROBERT L. SHURTER, publicity representative, Case School of Applied Science, University Circle, Cleveland 6, Ohio.

♦ To meet the insistent growing demand for more technical information on fabricating and processing aluminum in all its forms, Reynolds Metals Company has inaugurated a new service to the metalworking industries by establishing the *Technical Advisor*, a monthly technical paper devoted to publicizing latest recommendations on how to use aluminum-mill products most effectively.

The first issue, just published, carries a condensed technical description of the two main processes in the production of aluminum — the Bayer process of producing alumina from bauxite, and the Hall process for reducing alumina to metallic aluminum.

This first issue contains a discussion of various problems in connection with the use of aluminum in a mink waterer, portable kitchens, newspaper delivery tubes, buckets, sofa-bed frames, "colors" of various alloys; and the soldering of aluminum.

The periodical is sent free upon request to Technical Editorial Service, Reynolds Metals Co., 2500 So. Third St., Louisville 1, Ky.

♦ The International Nickel Co. Inc., 67 Wall St., New York 5, N. Y., have inaugurated a program which will make available useful material for classroom instruction in engineering institutions.

The development and research division will furnish to each institution an exhibit containing approximately 50 specimens of nickel-containing materials; a portable metals identification kit containing approximately 35 specimens of important metals and alloys for qualitative identification of metals and alloys (spot testing); literature and other technical and practical information concerning nickel and its alloys, and other data. Motion pictures of the company's mining, smelting, and refining operations also will be made available.

♦ The James F. Lincoln Arc Welding Foundation Design-for-Progress Program, which has been announced for 1947, is attracting interest in all parts of the country. The officers and directors of the Foundation are anticipating a large number of papers on the development of new arc welding usage in American industries before the closing date of June 1, 1947. Many of these papers, it is believed, will be of considerable value to the welding industry, as well as to the thousands of new enterprises now being started in every state.

The firm has issued a 4-page pamphlet, outlining in detail, some of the more important activities of the Foundation. Write for this and further information about hte Design-for-Progress Program to The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

♦ The school board of Clinton, Iowa, has revised the industrial-arts program, according to a plan proposed by W. H. Wagner, of the State Teachers College. Under the change, boys will take industrial-arts courses of their choice for

(Continued on page 33A)

A Good Teaching Tool

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● THE "FEEL" of a Stanley Plane in a boy's hands, its ease of handling... everything about this fine tool... backs up your instructions, inspires his confidence. Write for new Catalog No. 34. Stanley Tools, Educational Dept., New Britain, Connecticut.

HANDLE shaped for natural grip
LEVER for lateral adjustment of cutter
CUTTER—selected steel, individually hardened
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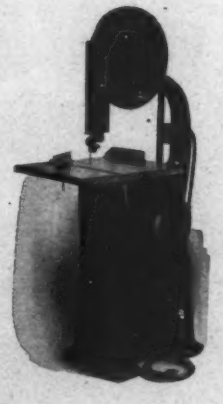
"OLIVER"

18-inch BAND SAW

Most complete Band Saw of its size!

"Oliver" junior size Band Saws have many refinements and adjustments developed for larger "Oliver" Band Saws. Table measures 24" x 20" — well ribbed, accurately machined. Tilts 45° to right. Has miter cross-cut gauge and parallel ripping fence. Takes 9" under guide, 18" between saw and column. Rips to 11" wide, miters and cross-cuts to 6½". This ball bearing, motor-on-shaft Band Saw is precision-built to give years and years of smooth, dependable service.



Write for Bulletin No. 192-D

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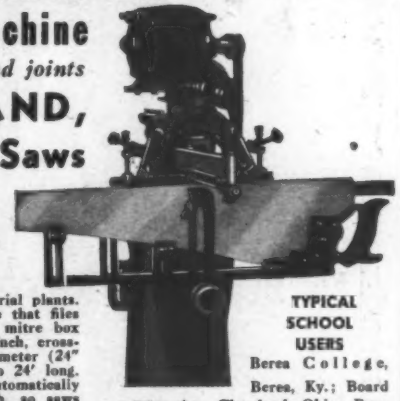
This ONE Machine

automatically files and joints

HAND, BAND, CIRCULAR Saws



The Foley Saw Filer is ideal for sharpening saws used by students in school shops. It keeps them in tip-top shape, faster and better than by hand filing. Used by Army, Navy, hundreds of manual training departments and industrial plants. The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer. Foley filed saws have less breakage and last longer.

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Association News

♦ The State Advisory Committee for Industrial Arts in Oklahoma schools, which has been operating for eight years, met for an all-day session in the State Capitol Building in Oklahoma City on Thursday, February 13. The agenda for the meeting included the consideration of one new state course of study, that for industrial drawing; the approval of a revised edition of the bulletin on accident prevention in the school shops in Oklahoma; the report of a committee on the revision of the requirements for the certification of the teachers of industrial arts in Oklahoma; and the report of the committee recommending the employment of a state supervisor for industrial arts in Oklahoma in the office of the State Department of Education.

The course of study in industrial drawing was referred to an editing committee for a final check. The accident prevention bulletin was approved and will be issued at an early date by the State Department of Education. The new certification plan calls for nine specific industrial-arts certificates, one for each of the following industrial-arts fields: automobile mechanics, craft and handicrafts, electrical work, general shop, general metalwork, industrial drawing, machine-shop practice, printing, and woodworking. In general, these certificates would require 18 semester hours common to all certificates, including 4 in woodworking, 8 in industrial drawing, 2 in methods of teaching, 2 in organization and administration, and 2 in industrial-arts design, plus 12 hours in specialized courses in the certificate field. This recommendation has been presented to the newly elected state superintendent of public instruction, Dr. Oliver Hodge, who has approved it in principle. It will be acted upon by the state board of education at some later date. The recommendation for a state supervisor of industrial arts was likewise approved by the state superintendent when a committee from the advisory group presented it for his consideration.

Members of the committee shown in the picture together with the areas represented are as follows from left to right around the table: Edgar J. Spady, director of vocational and industrial education, Oklahoma City; Prof. Mahlon C. Courtney, head, industrial arts department, Murray State School of Agriculture, Tishomingo; Darrel Stiles, president, industrial-arts section, Oklahoma Education Association, Bristow High School; Richard Kisner, classroom teacher of shopwork, Guthrie; Joe Ables, head of shops department, Oklahoma A. and M. College, Miami; Standifer Keas, chief high school inspector, State Department of Education, Oklahoma City; Prof. M. E. Franklin, director of industrial arts, Northeastern State College, Tahlequah; C. E. Paul, director, industrial education, Muskogee City Schools; Dr. Robert A. Hardin, chairman, department of industrial education, University of Oklahoma, Norman; Dr. DeWitt Hunt, chairman, head, department of industrial arts education and engineering shopwork, Oklahoma A. and M. College; Mrs. Hugh McDermott, Norman High School, Norman; Leroy Bengtson, classroom teacher, Central High School, Oklahoma City; C. L. Hill, associate professor, department of industrial arts education and engineering shopwork, Oklahoma A. and M. College; Glenn Smith, head, trade and industrial education, Oklahoma A. and M. College; E. P. Chandler, secretary and state supervisor, trade and industrial education, state board of vocational education, Oklahoma A. and M. College; Virgil Houston, director, industrial education, Bartlesville City Schools; Asbury Smith, Central State College, Edmond; John Cermak, head, department of industrial arts, Southwestern Institute of Technology, Weatherford, Okla.

♦ A spring conference on industrial education, including trades and industries, and industrial arts, will be held at Northwestern State College, Natchitoches, La., on April 18 and 19. Members of a committee planning the conference are: Walter J. Robinson, head, Industrial Education Department at Northwestern State College; T. E. Hampton, director, Natchitoches Trade School, and associate professor of Trades and Industries, Northwestern State College; H. O. Thomas, assistant state supervisor of industrial arts, Baton Rouge, La.; J. W. Mitchell, director, Southwest Trade School, Crowley, La.; J. W. Moore, director, Shreveport Trade School, Shreveport, La.

This is the first conference of this nature to be scheduled in the state. It will be open to the public. Administrative, teaching problems, and the promotion of practical education throughout the state are some of the problems to be considered.

(Continued on page 33A)

Oklahoma State Advisory Committee for Industrial Arts

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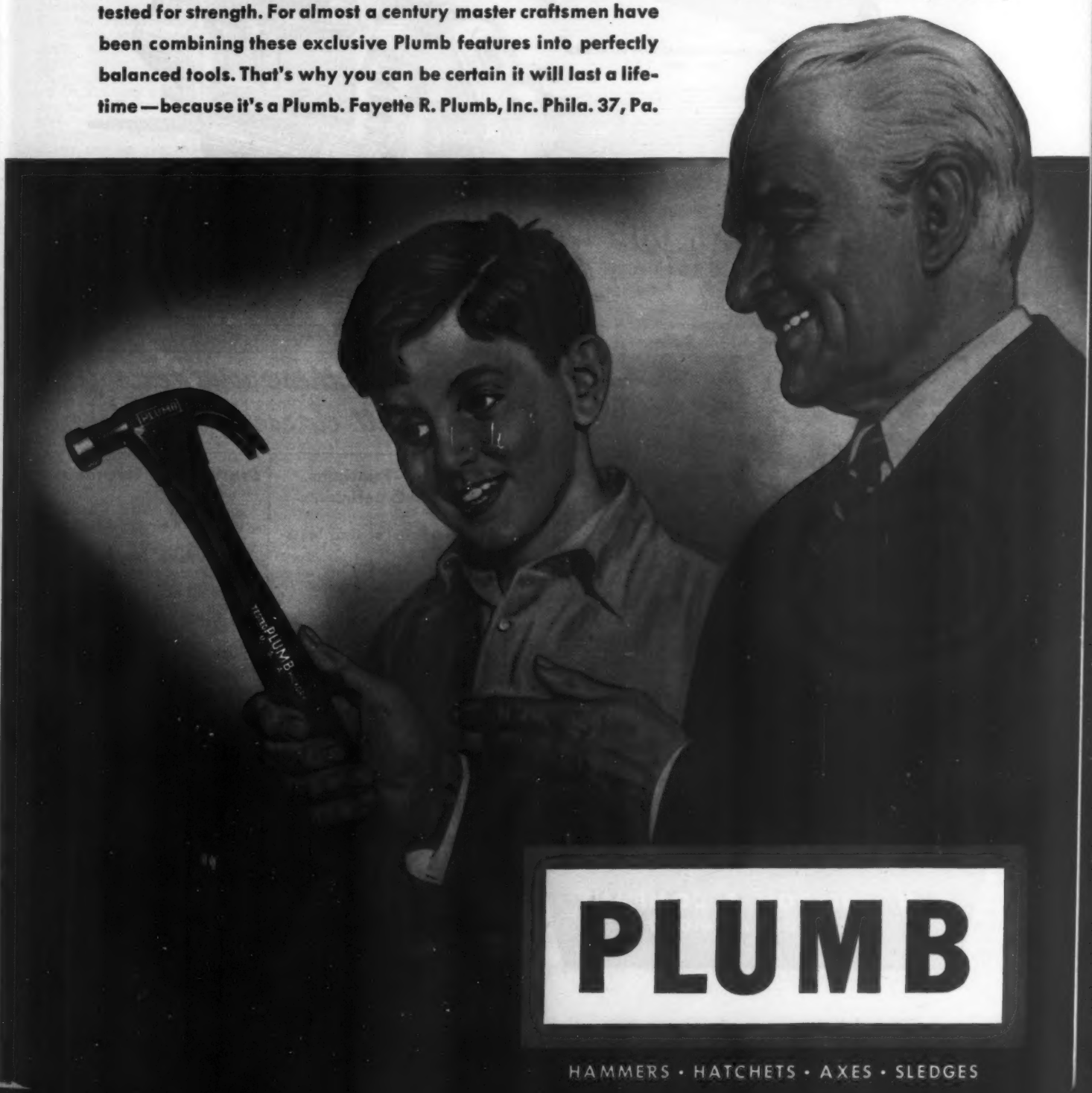

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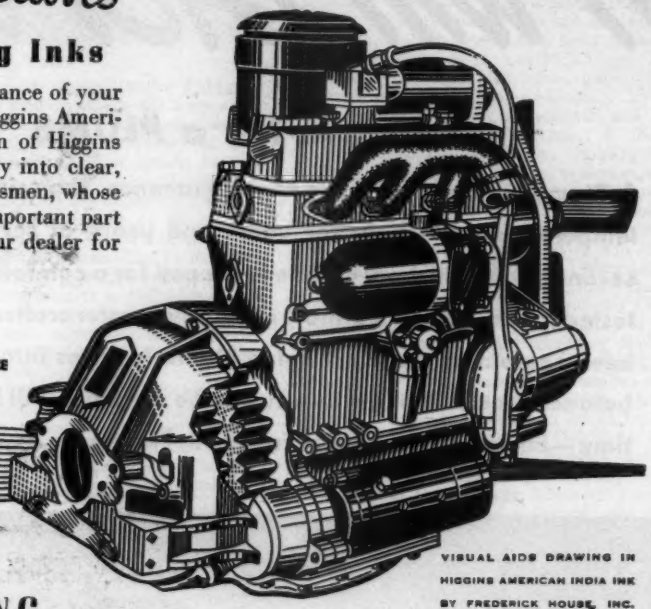

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(Continued from page 30A)

School administrators and specialists in the field of industrial education who will appear on the program are: E. L. Williams, director, Industrial Education Extension, Texas A and M, College Station, Tex.; Dr. H. H. London, head, Department of Industrial Education, University of Missouri, Columbia, Mo.; Dr. Claude Ewing, director of curriculum, Chicago Public Schools, Chicago, Ill.; Dr. Andrew Triche, state supervisor, Trade and Industrial Education, Baton Rouge, La.; Ed. G. Ludtke, regional agent, U. S. Office of Education, Washington, D .C.; Miss Violet O'Reilly, principal, Rauboin Vocational High School, New Orleans, La.; John Pearce, supervisor, industrial arts, New Orleans Public Schools, New Orleans, La.; Martin H. Giles, director, Isaac Delgado Trade School, New Orleans, La.; H. M. Wells, superintendent, Rapides Parish Schools, Alexandria, La.; H. A. Norton,, superintendent, Calcasieu Parish Schools, Lake Charles, La.; A. T. Browne, assistant superintendent, East Baton Rouge Parish Schools, Baton Rouge, La.; Dan Miller, engineer, Pittsburgh Plate Glass Company, Pittsburgh, Pa.

♦ On Thursday and Friday, May 1 and 2, State Teachers College, Oswego, N. Y., will hold its ninth annual industrial-arts conference. These conferences have been growing steadily in popularity and last year saw nearly 400 industrial-arts teachers and leaders in education, in attendance.

The two-day conference will be high lighted by Stanley Pawelek of Baltimore, Md., as key speaker. Other outstanding features of the program will include laboratory demonstrations in various industrial-arts fields, a formal dinner Thursday night at Oswego's Hotel Pontiac sponsored by Epsilon Pi Tau, visits from various members of the New York State Education Department, and a demonstration by a representative of the Aluminum Company of America.

The key speaker, Mr. Pawelek, is the present supervisor of industrial arts in Baltimore, Md., and has been an outstanding figure in industrial arts for a number of years. He is a contributor to many professional periodicals and has delivered a great many addresses before professional gatherings of this type.

♦ A group of representatives of the Missouri State Teachers' Association, led by president Earl Thomas; Zaid Lenoir, chairman of the steering committee; and Pearl Schwartz, executive secretary; met with Commissioner Wheeler, on February 8 to discuss (*a*) the expansion of the Negro division to include assistant supervisors in vocational agriculture, trades and industries, and home economics; (*b*) equalization of teachers' salaries throughout the state; and (*c*) the introduction of a new bill to the legislature for the establishment of a vocational institute in southeast Missouri.

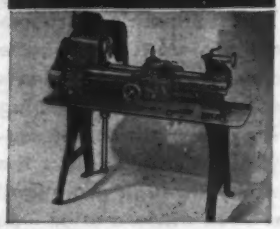
♦ The officers and executive committee of the North Carolina Vocational Association for 1946–47 consist of the following: president, Forest T. Selby, Charlotte, N. C.; vice-president, Mrs. Flora Homewood, Marion; secretaries, George V. Coggin, Raleigh; Mrs. Wilma Shim York, Sumner High School, Route 1, Greensboro; H. K. Collins, Senior High School, Durham; and J. F. Gibbs, Cooper High School, Nashville, N. C.

♦ The officers for the Industrial Education Club of the Iowa State College, Ames, Iowa, are: president, John F. Bancroft; vice-president, Oscar, Moen; and secretary-treasurer, Elmer Aurand.

♦ A state advisory committee meeting for vocational agriculture, was held at Jefferson City, Mo., on January 25. At this meeting plans were made for the state FFA contests, the operation of the state FFA camp, and the improvement of the vocational agriculture program.

The FFA contests will be held at Columbia, Mo., on April 23, 24, 25, and 26. In addition to the regular contests, contests in livestock, meat identification, dairy products, field crops, farm mechanics, and poultry, will be held.

The arrangement committee consists of C. V. Roderick, chairman; Sam B. Shirky, G. F. Ekstrom, C. M. Humphrey, O. R. Tripp, J. D. Harris, William Day, Clyde Bachtal, and Robert Busch.



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NEWS NOTES

(Continued from page 28A)

longer periods of time and they will be required to complete the preparatory work before taking on more advanced courses. Such subjects as mechanical drawing I, and woodworking I, will be semester courses, open to freshmen and sophomore students. Advanced mechanical drawing and woodworking will be one-year courses for sophomores and juniors, while additional one-semester courses will be offered to juniors and seniors in this type of work.

♦ L. E. Wass, director of vocational education in Davenport, Iowa, presented a report to the school board on the vocational education program in the schools, which is arranged in three steps: (1) a sound general education, (2) vocational guidance, (3) vocational training, (4) placement, (5) follow-up work, (6) retraining. The in-service program consists of occupational information, followed by specific training for those who elect special courses. In the occupations classes the students study the general fields of gainful occupations and later specific occupations in terms of the job. Students who elect specific training in the eleventh and twelfth grades are placed on jobs for half time, for which they draw wages from the employer and receive credit from the school. A general continuation school is operated for pupils between 14 and 16 years who are employed, or who may become unemployed after entering the part-time school.

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New Publications

The Production and Properties of Plastics

By S. Leon Kaye. Cloth, 612 pp., 6¼ by 9¼ in., illus., $5.00. International Textbook Co., Scranton, Pa.

A comprehensive text on plastics, which gives a résumé of the early development of plastics, and then presents several chapters on phenolic and other thermoplastic materials. It also shows how the various plastic textile fibers are produced and how synthetic rubber is made.

Other chapters describe how these plastics are tested, molded, cured, laminated, etc. The finishing of molded and laminated products also is explained, and inspection methods for use with plastic products also are described.

There also is a chapter on estimating as applied to work with plastics. The appendix contains a directory of plastic trade names, a glossary, and a selected bibliography.

Attractive Lawn Furnishings

By Paul V. Champion. Cloth, 79 pp., 6⅜ by 9¼ in., illus., $2.50. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

The author of this book is very insistent that many fine and useful things can be made out of lumber that is salvaged from containers, boxes, and crates used for shipping merchandise of various kinds. In this book he shows how well-designed and sturdy pieces of furniture for lawn and garden can be made of material obtained in this way. Among the articles presented are tables, benches, settees, stools, chairs, flower boxes and stands, trellises, fences, arched gates, and similar pieces of lawn furnishings.

Concise Chemical and Technical Dictionary

Edited by H. Bennett. Cloth, 1055 pages, 6⅜ by 9¼ in., $10. The Chemical Publishing Co. Inc., Brooklyn 2, N. Y.

This dictionary contains about 50,000 definitions and gives information about newly developed synthetic chemicals, processes and apparatus; thousands of chemical, physics, metallurgical, mineralogical, biological, medical, pharmaceutical, mathematical, botanical terms; descriptions of the most important manufacturing processes and machinery; raw materials and finished products; terms used in mechanical, electrical, radio and television engineering, welding and other shop practices; descriptions of every common or rare chemical, etc. It includes terms gathered by the Allied Combined Intelligence Objectives in Germany and other occupied countries.

A special feature of the dictionary is the listing of thousands of trade name or proprietary products in the synthetic resin, plastic, metal, rubber, textile, food, pharmaceutical, paint and varnish fields, including emulsifying and wetting agents, plasticizers, detergents, accelerators, antioxidants, etc.

Plastic Craft

By Ernest S. DeWick and John H. Cooper. Cloth, 184 pp., 8⅜ by 11¼ in., illus., $5. The Macmillan Company, New York, N. Y.

A very interesting book on a very interesting subject. It gives the beginner a good idea of the entire subject of plastics, their versatility, and how they can be used in school and home shops.

It also shows how plastics can be used in the art studio for making etchings, and how it can be turned into useful and beautiful articles of many kinds.

The list of projects shows many things that can be made by students of varying abilities.

Full directions are given on how it may be sawed, filed, drilled, threaded and tapped, sanded, turned, grooved, planed, cleaned, polished and buffed, cemented, bent, heated, embossed, carved, formed, jointed, inlayed, and dyed.

The book also contains a table giving addresses of firms handling needed supplies for plastics and a table on buffing wheels, speeds, and compounds that may be used for polishing plastics.

How to Supervise People in Industry

By Dr. Eliot D. Chapple and Edmond F. Wright. Cloth, 123 pp., 5⅝ by 8¼ in., $2.50. National Foremen's Institute, Inc., Deep River, Conn.

A book that is full of the kind of facts that a foreman should have at his command.

The authors show how production is affected by human relationships, how the workers must be handled to avoid trouble between individuals and dissatisfaction with working conditions or changes in procedures.

It's Your Home

By Dora S. Lewis, Anna K. Banks, Marie Banks, Gertrude Borgeson, and Gladys Peckham. Paper, 173 pp., 8⅜ by 11 in., illus., $1. The Macmillan Company, New York City.

A textbook for students in home-economics classes. The contents cover such basic problems as personal adjustment in the home and the community, the selection and care of clothing, the choice and preparation of food, budgeting, and home management.

The book is concrete and practical, giving not merely a general discussion of a principle, but also concrete aspects of that principle as applied to the individual.

Shoe Repairing

By Henry Karg. Cloth, 138 pp. 6¼ by 9⅜ in.,

(Continued on page 36A)

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Aircraft Woodwork

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This text by an experienced teacher presents the background information, full instruction in tools and techniques, and step-by-step shopwork for a course that meets all the CAA requirements for the aircraft mechanic's license in woodwork. Illus. $3.50

Shaper Operations

By Lewis E. King

The third book in the King series of manuals for Machine Shop Operation. (Previously published: *Lathe Operations; Milling Machine Operations*). Organized for study either in the shop theory class or in the shop concurrently with work on the machine. Illus. $1.00

Practical Marine Electricity

By S. N. LeCount and H. S. Dusenbery

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By Shute, Shirk, Porter and Hemenway

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Aircraft Drafting

By H. H. Katz

Written by a man who has trained hundreds of draftsmen for Republic Aviation and Consolidated-Vultee, this book includes much useful information on manufacturing practices as well as full, clear instruction in aircraft drafting techniques. Illus. $5.00

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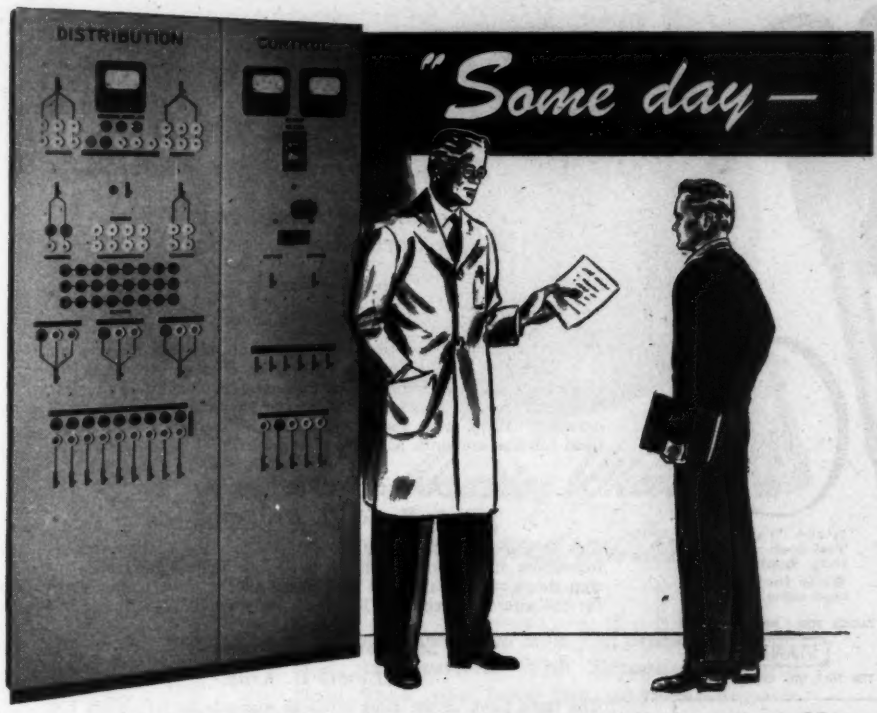
By Ralph Atherton

Very clearly presented, practical instruction in the fundamental operating principles of all parts of radio including antennas. Makes use of the methods and teaching aids found so successful in training personnel for war service. Includes 470 illustrations, class demonstrations, lists of visual aids, and much other helpful teaching material. $3.75

The Craftsman Prepares to Teach

By D. F. Jackey and M. L. Barlow

Simply written, practical directions for planning and conducting all types of vocational courses. A useful handbook for teachers. $2.00



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(Continued from page 34A)

illus., $2.50. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

This is a very practical text on the repairing of shoes. It acquaints the learner with the common types of shoe construction, how these different types of shoes can be resoled, how repairs are made, and how the different types of heels can be built up and attached.

Shoe repairing tools are also pictured and described, and information is given on the materials used by the repairman, the kinds of leathers that are used, and what must be done to make a success of the shoe repairing business.

Manufacturing Processes

By Myron L. Begeman. Cloth, 626 pp., 5¾ by 8½ in., illus., $5. John Wiley & Sons, Inc., New York City.

This is a new edition of this standard work on shop processes. It contains much added material, which brings the book into conformity with the most recent advances in manufacturing methods. As before, technical fundamentals of engineering processes and methods have been stressed and thorough discussions of modern improvement have been included. With modern machine-shop practice offering such a variety of manufacturing processes that the choice of the most efficient and economical is often difficult, a book such as this becomes a real asset to the production engineer.

Plastics Molds

By Gordon B. Thayer. Cloth, 272 pp., 6⅛ by 9⅛ in., illus., $5. Huebner Publications, Cleveland, Ohio.

This is the third edition of this book. It has been rewritten and brought up to date. The author is an engineer who has had much experience in tool and machine designing and is continuously engaged in developing more effective molding and fabricating techniques for producing articles made of plastics.

The 23 chapters of the book discuss design procedure, practical points in mold design, materials to be used in making molds, types of molds, finishing methods and equipment, plastic tooling, and estimating plastic molds.

The book also contains a shrinkage chart and a glossary of terms.

Learning to Weld

Published by The Lincoln Electric Co., Cleveland, Ohio. Bound in paper, 32 pp., 5½ by 8½ in., illus., 25 cents in U. S. A., 35 cents elsewhere.

This book presents a basic approach for those who want to start to learn arc welding. The booklet's purpose is to teach how to weld and to assist in applying arc welding to the repair of broken parts, the hard surfacing of worn parts, and the building of miscellaneous equipment.

Subjects treated include the following: protective clothing and equipment; striking the arc; various welding positions; types of welds; fit-up of parts; procedures for various welds including fillets in horizontal, flat, vertical, and overhead positions, butt welds, lap welds, corner and edge welds; welding cast iron; hard surfacing.

The book also contains a glossary of welding terms.

Making Things Is Fun

By Susan E. Boehmer and Chris H. Groneman. Book 1 — paper cover, 128 pp., 8⅛ by 11 in., illus., 30 cents. Book 2 — paper cover, 96 pp., 8⅛ by 11 in., illus., 45 cents. Published by The Steck Company, Austin, Tex.

These books describe step-by-step how to make numerous projects that will please youthful workers.

Book 1 covers cardboard cutouts, simple tools, wood toys that can be cut out with a coping saw, clay and papier-mâché work, stick and potato printing, and painting and decorating.

Book 2 presents more advanced problems in wood, metalwork, soap carving and whittling, and linoleum block printing.

Veterans Handbook and Guide

By Tracy E. Goodwin. Cloth, 511 pp., 5⅞ by 8½ in. The Hobson Book Press, Cynthiana, Ky., and Goodwin Publications, 1778 Fairmount Ave., Cincinnati 14, Ohio.

The author was a combat soldier himself. After analyzing his postwar chances he put his conclusions and findings into book form. The material has helped him — it will help other G.I.'s as well — in determining how to shape the future of the man who had to go through the cataclysmic turmoil of World War II.

The Preparation and Use of Visual Aids

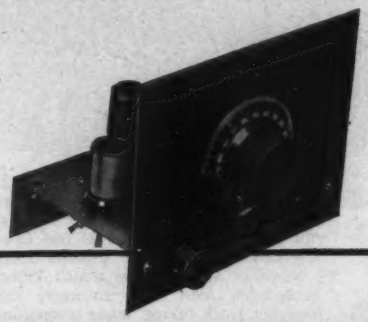
By Kenneth B. Haas and Harry Q. Packer. Cloth, 224 pp., 6⅛ by 9¼ in., illus., $4. Prentice-Hall, Inc., New York City.

An interesting book on how the teacher alone or aided by his students can make very helpful teaching aids.

The material in the book discusses motion pictures — how obtained, how they may be made at the school, and how they are used.

The same discussion treatment is given to strip films, sound films, training films, and the opaque projector.

(Continued on page 44A)



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C. COURSE MAKING IN INDUSTRIAL EDUCATION — *Friese* — A textbook that deals solely with course planning in vocational and industrial arts education, including five sample formats. Easy to use, direct, clear and logical in every development. Cloth, $3.50

D. PRINCIPLES OF TRADE AND INDUSTRIAL TEACHING — *Selvidge and Fryklund* — Rev. ed. Covers objectives and methods, the psychology of teaching and learning — a sound plan of definite procedure in teaching the trades and industrial arts. Cloth, $3.00

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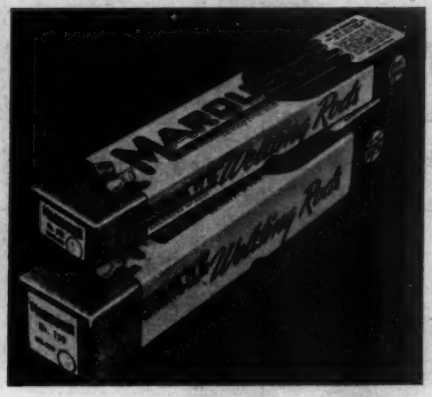

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PITTSBURGH COLOR DYNAMICS EXPLAINED

A full color, 32-page booklet now being published by the Pittsburgh Plate Glass Company, presents the facts and figures, plus numerous views of actual use of color in manufacturing and processing plants. The booklet demonstrates how by following the principles of color dynamics, one can improve efficiency of operation and maintain quality and promote continuity of production.

In a special section the booklet outlines the scientific facts about color. "The medical profession," it states, "has long realized that colors can be used to stimulate or depress. Some colors help people relax and be cheerful. Others stimulate and invigorate them. Still others set up irritation and actual physical discomfort."

The booklet points out that use of color is in no way an experiment. Color principles have been widely tested in both laboratory and in all types of plants.

Individual sections are devoted to the use of color on machinery and equipment; on walls and ceilings; and on floors, aisles, and mobile equipment with emphasis on color for safety. Each section is illustrated with full-color applications. A special section contains simplified and practical material specifications for industrial painting.

Free copies of the booklet may be had from Dept. NIB Public Relations Department, Pittsburgh Plate Glass Company, 632 Duquesne Way, Pittsburgh 22, Pa.

For brief reference use IAVE—0502.

ANALYSLIPS

Ditto Incorporated has developed a patented method of breaking down any list of items by item — each item on a separate sheet of paper — without rewriting.

It is done by running a set of overlapped strips called "Analyslips" through a Ditto duplicating machine to pick up one item on each Analyslip. As many as thirty such slips can be run through the machine at one time. The slips are then torn apart and used as desired.

Some of the ways in which Ditto Analyslips have been used are: inventory control, sales analyses, stock taking, labor tickets, movie tickets, analyses of purchases, inspection unit copies, hospital charges, catalog preparation, and the like. This method may also be found useful in the schools and school shops.

Ditto Precision Spaced Analyslips can be made in practically any size, either paper or card stock, in any number of units to a set printed on one or both sides.

For further information address Ditto Inc., 2243 W. Harrison St., Chicago, Ill.

For brief reference use IAVE—0503.

SECTION TWO OF MILLING MACHINE TREATISE

Section two of "A Treatise on Milling and Milling Machines" is now available. It covers the milling process; chip formation, surface finish, and cutting fluids; power required in milling; and the mounting of milling cutters.

The "Treatise on Milling and Milling Machines" was to be printed in four separate sections or volumes and then reprinted as a complete book. Due to the extra expense of this plan and to various unavoidable delays, it has been decided not to print sections three and four as separate volumes, but wait until the entire book is completed and then print it as a unit. The complete edition should be available by the end of this year.

Section two is priced at $1 per copy, postpaid. Write for a copy to Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

For brief reference use IAVE—0504.

TRAINING THE SERVICEMEN

The Victor Animatograph Corporation recently finished up a class of 24 trained servicemen, and another class is now in training at the Victor factory in Davenport, Iowa.

These servicemen are provided with a free two-week course in the service and repair department. This factory training under the supervision of Victor's own skilled representatives provides Victor distributors with men who can efficiently service their 16mm. sound motion picture equipment.

This course has been so popular with Victor distributors that it has been necessary for W. E. Kellogg, Victor's service and repair department head, to put applicants on a regular schedule. Thus, with only a few men taking the course at one time, a maximum of personal instruction is available for the trainee.

For brief reference use IAVE—0505.

COATED ABRASIVES IN THE METAL WORKING INDUSTRY

Behr-Manning Corporation, Troy, N. Y., has just published "Coated Abrasives in the Metal Working Industry" as an additional supplement to their "Lecture Course on Coated Abrasives."

It contains 12 full pages of information and illustrations on grinding, shaping, finishing, and polishing metals, taken directly from the experience developed on hundreds of production applications in metalworking plants.

This material has been written especially for industrial arts and vocational education instructors who are teaching metalworking classes.

Free copies are available on request.

For brief reference use IAVE—0506.

(Continued on page 41A)

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only **10c** SPECIAL OFFER

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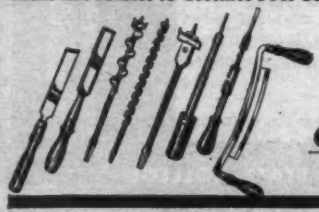

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You Can Whittle & Carve by F. H. Gottshall — $2.25

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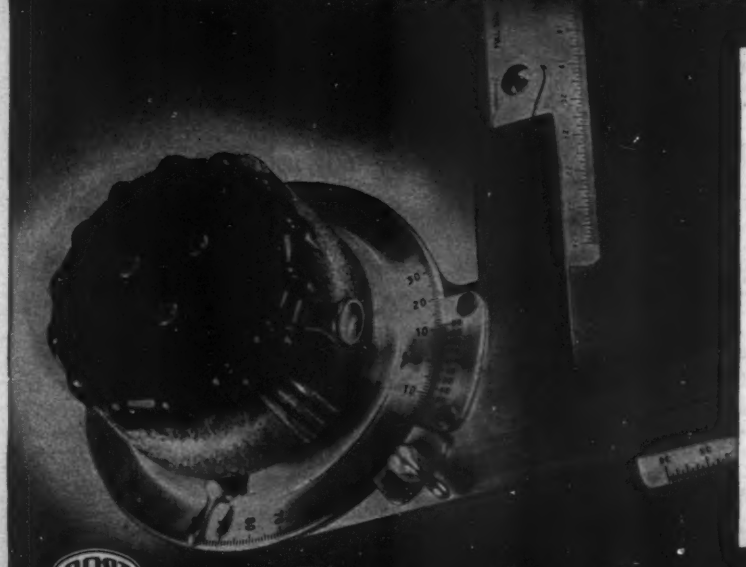

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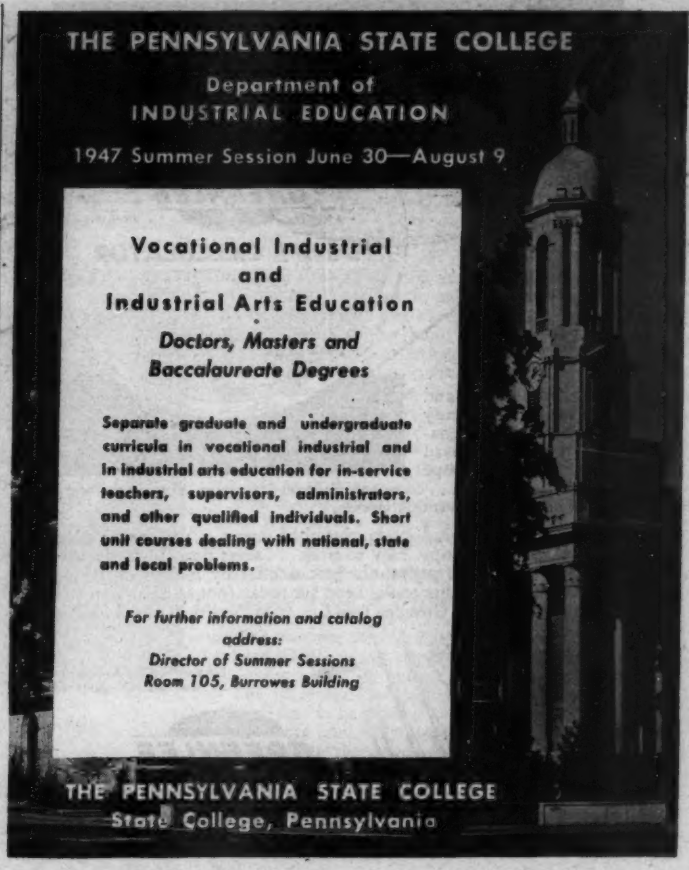

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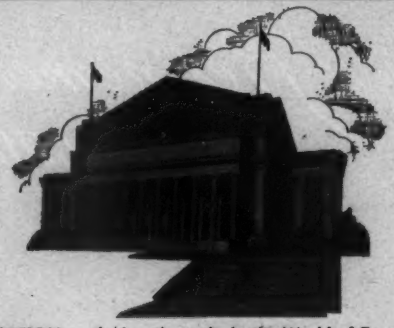

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THAT STATEMENT from the 1947 American Association of School Administrators Yearbook is not new to people associated with education, but the implications of that statement are still being ignored by scores of people concerned with teachers' salaries and school appropriations. They must be shown that education — and vocational education in particular — has put more money into their pockets, has provided security, has improved everyone's standard of living, and has proved that education is not an expense but the finest investment in the world.

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(Continued from page 38A)

INSULATING VARNISHES

A 40-page reference booklet containing complete technical and application data on G-E insulating varnishes has been issued by the Resin and Insulation Materials Division of the General Electric Chemical Department.

The booklet includes specifications, electrical properties, film properties, cure and aging, chemical properties and baking and air drying cycles of each type. Types consist of black baking, black air drying, clear baking, clear air drying, black baking and air drying, clear baking and air drying, sticking varnishes and air drying and baking enamels. Thirty-six grades are described.

For brief reference use IAVE—0507.

STAINLESS STEEL ELECTRODES

A complete line of stainless steel electrodes in a full range of grades and diameters has been announced by Air Reduction Sales Company, 60 East 42nd Street, New York 17, N. Y.

All Airco stainless steel electrodes are furnished with a heavy extruded lime type coating for d.c. application. In addition all but the straight chrome analyses are obtainable with a lime-titania type coating which is usable on a.c. or d.c. The slag produced by either of these coatings is easily removed.

Electrodes with the lime-titania (a.c.–d.c.) type coating eliminate arc blow and result in easier manipulation, more uniform arc action, and better appearance of deposit. This class of electrodes can be recommended for all applications on which the lime type of electrode is used, with the possible exception of highly restrained joints on heavy sections or on steels of high hardenability.

For further information on the new stainless steel electrodes, write to the New York office or the nearest Airco sales office.

For brief reference use IAVE—0508.

A NEW BOOK ON FIRE FIGHTING

The American-LaFrance-Foamite Corporation of Elmira, N. Y., has just published a 24-page illustrated book entitled "What You Should Know About Modern Fire-Fighting Devices."

The book describes and illustrates the proper use of the various types of fire-fighting devices for the class of fire for which each is intended.

It is a most complete and comprehensive textbook on how to quickly stop small fires from becoming big blazes with their awful toll of human lives and property damage.

A free copy may be had for the asking.

For brief reference use IAVE—0509.

NEW SOUND SLIDE FILMS AVAILABLE

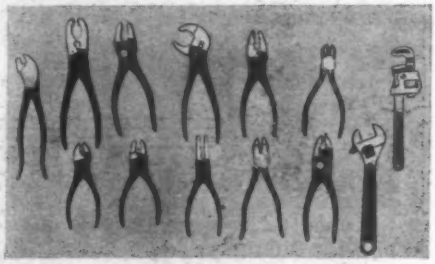
"Behind the Counter," a completely new and up-to-date series of sound slide films for training retail sales personnel, has been announced by the Jam Handy Organization. Five sound slide films on friendliness, attentiveness, helpfulness, sincerity, and enthusiasm, are comprised in the series. This material may be used as a basis for a retail training course, or for any program now in operation. It is obtainable from the Jam Handy Organization, 2822 East Grand Blvd., Detroit, Mich.

For brief reference use IAVE—0510.

PLOMB TOOL COMPANY ACQUIRES EASTERN PLANT

Acquisition of the J. P. Danielson Company factory in Jamestown, N. Y., for the manufacture of pliers, adjustable wrenches, and pipe wrenches, has been announced by the Plomb Tool Company, Los Angeles. The new plant provides additional tool manufacturing facilities in the East. Plomb's two plants in Los Angeles are now supplemented by factories in Chicago, Jamestown, and Portland, Ore.

The Jamestown plant currently is making 6 pipe wrenches, 11 adjustable wrenches, and 26



Plomb pliers and wrenches

pliers, including thin jaw, bent nose, diagonal, brake spring, battery, needle nose, duck bill, ignition, wrench, water pump, side cut, slip joint, universal, gas, telephone, lineman's and combination types.

The Danielson plant employs about 240 people in a modern factory, which has about 84,000 square feet and is situated on a 4-acre site. Management of the plant is continuing under John P. Danielson, son of the founder and president for the past six years.

ANNOUNCES REVOCATION OF MANUFACTURER'S FEDERAL EXCISE TAX

The Eugene Dietzgen Co., 2425 N. Sheffield Ave., Chicago 4, Ill., announces that the excise tax has been revoked on the following sensitized papers: blueprint, Van Dyke, and direct and Dri-Print.

Since this tax was revoked as of the day it was imposed, all tax collected to date will be refunded. The firm is preparing and will send a credit memo covering this refund.

(Continued on page 44A)

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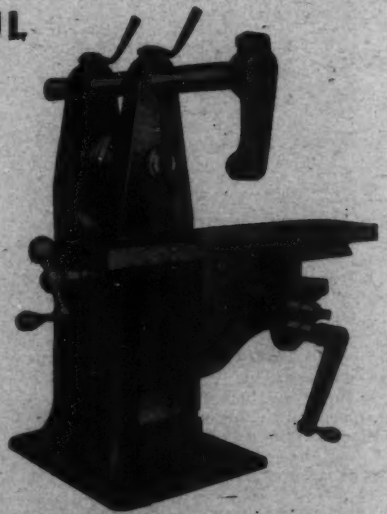

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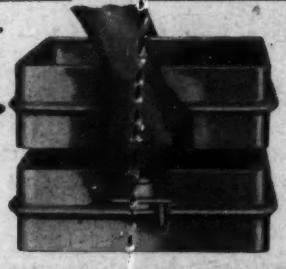

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(Continued from page 41A)

STERLING TOOL PRODUCTS PLANS INCREASED FACILITIES

Plans to triple present plant facilities have been made by the Sterling Tool Products Co., Chicago, Ill., manufacturer of portable sanding machines.

The construction of the new plant on the southeast corner of Hawthorne and Armitage Avenues in Melrose Park, Ill., just west of the Chicago city limits, has been started. The one-story combined factory and office will contain 95,000 square feet of floor space when completed. The first unit of 45,000 square feet is being built with the remainder of the plant to follow as soon as the first unit is occupied.

NEW DITTO SALES DIVISION

The Ditto Company has announced the creation of a new sales division, with Elmer Harris as field sales manager; Mark Peacock as merchandising manager; Frank Gregor as advertising and sales promotion manager; Fred Burkhart as product sales manager; and Syd Date as sales control manager in charge of market studies, sales potentials, problems of distribution, and product and dealer surveys.

NEW EXPORT DIVISION AT KENOSHA

The Snap-on Tools Corporation, Kenosha, Wis., have transferred the export functions of the firm from New York City to Kenosha, Wis. D. C. Beaulieu has been appointed manager of the new division.

DRAFTING INSTRUMENT CATALOG

The new drafting instrument catalog is available from the Park Instrument Company, 93 West Palisade Ave., Englewood, N. J.

In this catalog are described the No. 900 and the No. 700 drawing sets which differ in price because of differences in the construction, but not in the grade of the materials used.

Transparent irregular curves, which can be purchased singly or in sets also are described, as are also triangles, protractors, an ingenious geometric line spacer, and proportional dividers which are provided with a line scale and a circle scale. This latter scale enables the user to divide circumferences of circles into any number of equal parts.

For brief reference use IAVE—0511.

NEW PUBLICATIONS

(Continued from page 36A)

Other subjects discussed are maps, charts, graphs and diagrams, flash cards, posters and manuals, pictures and photographs, blackboard and bulletin board, objects and models, preparation of a training laboratory and field trips.

Principles and Techniques for Directing the Learning of Typewriting

By William R. Odell and Esta Ross Stuart. Cloth, 250 pp., 7¾ by 10⅝ in., $2.50. D. C. Heath and Co., Boston 16, Mass.

This is the second edition of this book, the object of which is to increase the efficiency of teachers of typewriting by clarifying and simplifying for them the psychological implications met with in teaching their subjects.

The book presents a classroom organization for effective working and learning, describes the necessary physical equipment, shows how to direct the acquisition of skill, discusses other basic considerations underlying teaching techniques, and then outlines these techniques for teaching touch typewriting.

Unfinished Business in American Education

By John K. Norton and Eugene S. Lawler. Paper, 64 pp., 10¾ by 8¼ in., illus., $1. National Education Association and the American Council on Education, 744 Jackson Place, Washington 6, D. C.

An inventory of public school expenditures in the United States.

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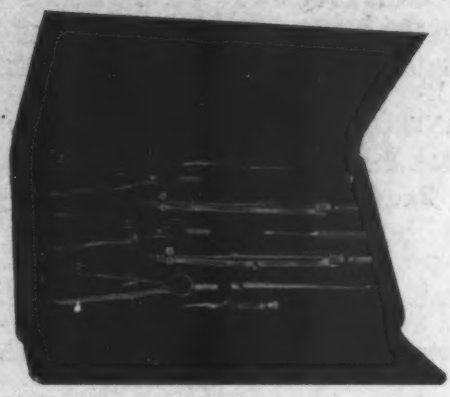

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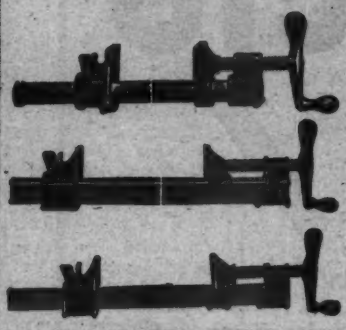

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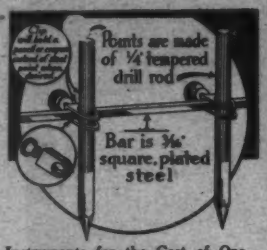

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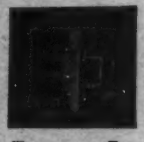

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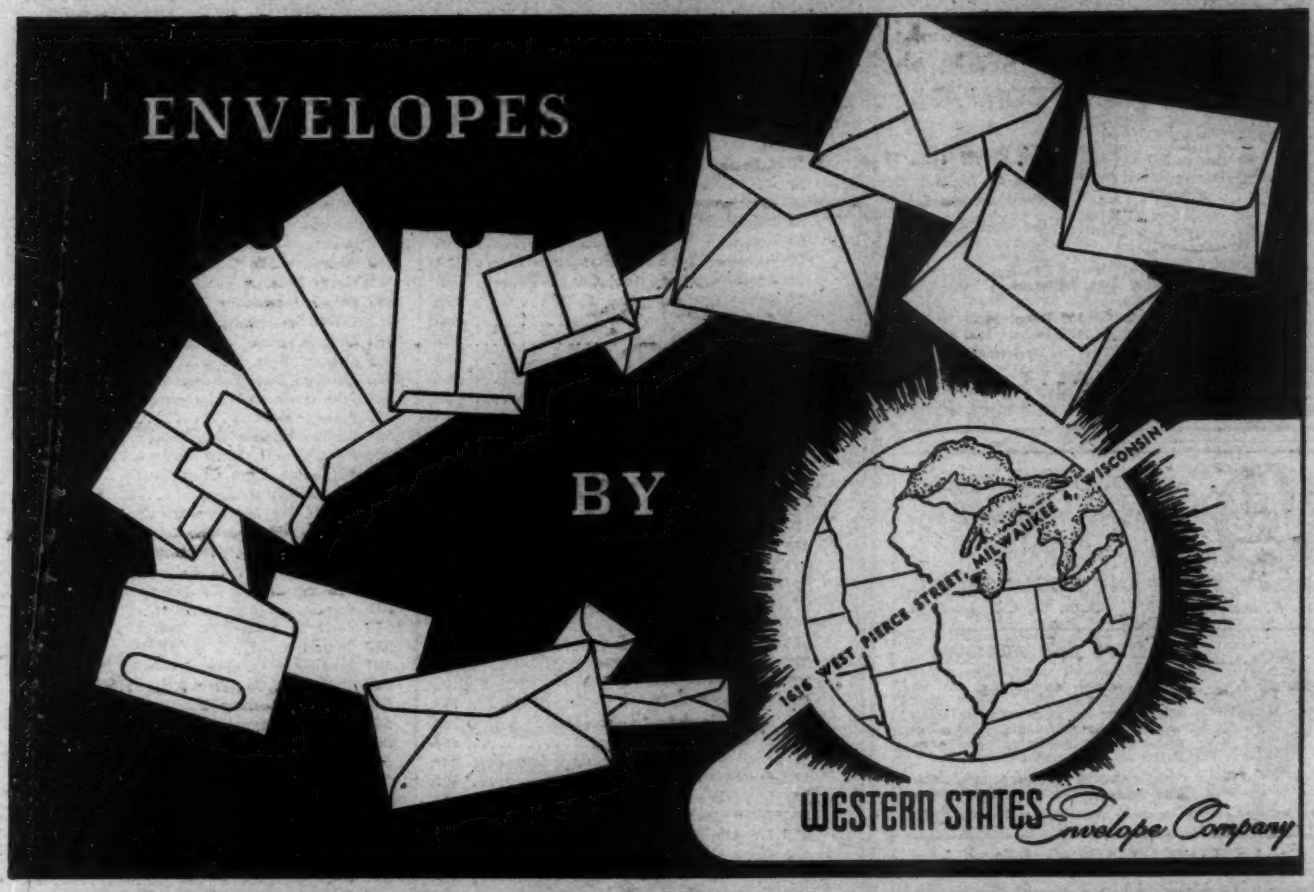

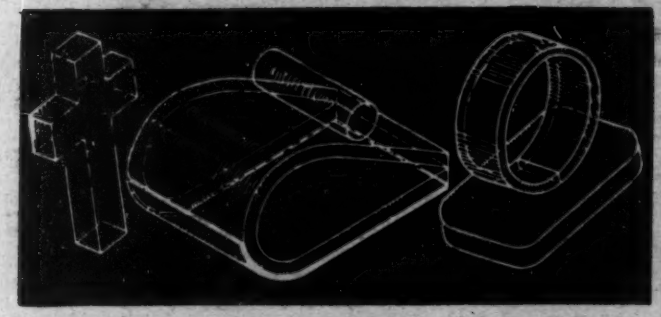

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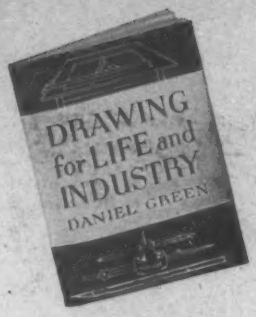

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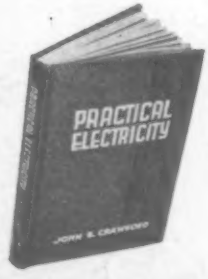

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